# FOOD MANUFACTURE

APR 20 1948

CONTAINERS *by* "GEEMANCO"

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## Bakers' Remuneration

BAKERS are dissatisfied with their present margin of profit on bread, and measures for obtaining an improvement have been discussed at trade meetings. A deputation from the trade recently met Ministry of Food officials to urge an increase in the bread subsidy.

The Ministry claims to allow bakers a profit of 5s. per sack of 280 lb. of flour. The trade declares, however, that that was the rate of profit before the war and that it is totally inadequate under 1948 conditions. It is also claimed that the costings for September last showed that the profit was only about 3s. 8d. a sack, but it is understood that the Ministry does not agree with that figure.

The trade is satisfied that a number of bakers in country districts are receiving totally inadequate remuneration under present conditions, and efforts are being made to induce more of these firms to supply costings as evidence of their true position.

Bakers are concerned about the constant rise in operating costs, including wages, and it is not yet known whether the Government White Paper on costs and wages will halt the workers' demands. The Government themselves are said to be directly responsible for some of the increased costs the trade has to bear.

Midland bakers have expressed the view that an increase should be made either by increasing the retail price of bread or by adjusting the subsidy. It is believed that either course would be unpopular with the Ministry, largely because of the effect on the cost of living. An increase in the retail price of bread would fall most heavily on the poorest sections of the public, and might cause hardship in some cases. An increase in the bread subsidy (but not in the retail price) would necessitate increases in the retail prices of certain other controlled foods in order to keep the total cost of food subsidies within the present figure of £392,000,000 annually. Could this be done without hitting the poor?

The recent increase of 1¼d. in the retail price of eggs will cost the public £15,425,000 a year, and the rise in the price of bacon will cost another £9,900,000, the object of these increases being to keep the food subsidies at their present level. Any material addition to the weekly budget of working-class families might result in wages claims that would be contrary to the hopes expressed by the Government in the White Paper.

## Canine Hysteria

Just over a year ago considerable attention was being paid to the matter of flour treated by the "agene" process, its effect on dogs, and its possible effect on human beings (FOOD MANUFACTURE, 22, 2, 52; 3, 99; 5, 216-218). The subject has not been neglected in the United States, and in a letter sent by the Food and Nutrition Board of the National Research Council to the Commissioner of Foods and Drugs it is stated that in the judgment of the Board there is a definite risk of injury to human beings attached to the use of agenised flour. The Board recommends the following:

1. Investigations should be continued to isolate and identify the toxic product(s) involved, to determine more conclusively whether human beings are in some degree susceptible, to determine precisely the toxic dosage for those species which are susceptible, and to develop a method for quantitative determination of the toxic substance for flour inspection purposes.
2. Alternative processes of flour treatment, especially with chlorine or chlorine dioxide, should be thoroughly explored to make certain that flour so treated is free from toxic effects.
3. Development of preferred alternative processes should be encouraged so that suitable commercial equipment and controls may be made available to mills as early as possible. The Board recognises that extensive engineering efforts are being made to overcome difficulties in the application of chlorine di-

oxide to flour, and according to present reports many months of work may be required for a satisfactory solution of this phase of the problem.

4. In the meantime there should be reduction of the use of "agene." It should be employed only on such varieties and lots of wheat as may require it, and in all cases of its use the amount of nitrogen trichloride applied per unit weight of flour should be restricted to the minimum consistent with a product which can be used satisfactorily in bakeries.

The Board considers that the present food crisis might be aggravated by a more drastic and immediate restriction of familiar practice at this time. It might decrease output of bakeries, increase costs because of new technical difficulties, or waste flour by spoilage of batches in the baker's shop.

## Fish and Chemicals

In the February, 1948, issue of FOOD MANUFACTURE (p. 51) attention was drawn to the absence of news about further developments in the use of fertilisers to increase fish growth and fish population. Although we still feel that the next logical stage in this work is the application of the idea to an open-sea breeding ground, we are at least relieved to hear that Scotland does not intend the 1942-1946 progress to remain on the shelf. At Edinburgh on February 27, Mr. Arthur Woodburn, Secretary for Scotland, announced the formation of a committee of seven scientists to develop the work under the guidance of Professor C. M. Yonge, F.R.S., who holds the Chair in Zoology at the University of Glasgow. According to a Press report, one object of the new phase in this work will be the attempt "to make Scottish trout bigger, better, and more plentiful." Laboratory developments will be based on Pitlochry, and it is intended that the large reservoir under construction for the Scottish Hydro-Electric Board shall be the scene of the first large-scale experiments with trout.

In one sense, this is not a continuation of the University of Edinburgh's previous work at Loch Craiglin and Kyle Scotnish, which were coastal areas of sea water. In that work Dr. Gross and his team concentrated upon the effects of fertiliser-stimulated plankton on sea fish like plaice and flounders. Now Scotland will be following the Canadian lines of development, where trout growth in inland lakes has been remarkably increased by fertilisers. In one Canadian lake trout fry after four years had developed an average weight of only three-quarters of a pound; a complete fertiliser was added, and in one year this average weight had increased to a pound and a half. Other Canadian work at a trout hatchery has shown that fertiliser application rates in 1:3:5 ratio gave trout yields of 65, 70, and 121 pounds per acre. One important difference between sea-water and fresh-water results has been the need for potash in the latter. Sea water is abundantly supplied with potash, and it is nitrogen and phosphates that become exhausted quickly in plankton development; but in fresh-water lakes all three nutrients soon become deficient in the static surface layers.

The choice of Professor Yonge to lead the further research work could not be bettered. He has had wide experience of marine laboratory investigations in Europe and in America, and he is a member of the Advisory Committee on Fishing Research. No British scientist would be more likely to develop the work along the broadest possible lines. We can feel assured that in concentrating on the improvement of fresh-water trout the future Scottish work will not ignore the practical potentialities of this idea for the sea fisheries.

## Cold Storage in the Bakery

The successful use of cold storage in reducing bakery labour costs has been achieved by at least one large modern bakery in Scotland. An even more important aspect is the elimination of night working which has long been a bugbear in the industry. Where a considerable early morning trade in rolls is a feature of the trade there would normally appear to be little alternative but to bring workers in overnight or, at best, to start in the early hours of the morning—a situation which bakers' employees have opposed persistently in recent years and for which no evident or complete remedy has yet been found. However, where production is carried to the stage of final proving the previous night and the dough, ready for final proving and baking, is put into the chill room overnight, the morning shift has only to remove the prepared shapes and complete the work in a fraction of the time normally required. In one bakery by this means some 6,000 rolls are being produced every morning, in record time, and with a minimum of difficulty.

The product is stated to be comparable with bakery goods produced by previous methods. The whole subject is undergoing continued investigation to ensure that advantages are accentuated and disadvantages reduced.

The use of cold storage is not so simple as it might first appear. One large bakery servicing a considerable wholesale trade points out that it would require cold storage space out of all proportion to the size of the bakery and so far as the small bakery was concerned, it would seem that very little benefit would accrue from the adoption of such methods.

So far as can be ascertained there is no great interest in quick freezing by Scottish bakeries, although the development of this situation is being watched with interest. The equipment position is one reason why larger producing units are believed to be hesitant. As they see things, no great expansion of quick frozen sales can be expected until refrigeration firms can produce an adequate volume of household cabinets, sales cabinets, specially constructed transport vehicles, and cold stores in the manufacturers' own plants. Considerable time must elapse before such expansion can be realised, but the economics of the situation may possibly change during the interim.

## Films in Industry

The use of films to demonstrate production processes is a comparatively recent development, but one with tremendous possibilities, especially where the film can be linked with a *résumé* of the subject. This and other advantages were demonstrated by the screening in Glasgow of the American film "Inside Story of Cake Making."

Shown at the Royal Technical College, Glasgow, through the courtesy of the College authorities and the Scottish Film Council, the film attracted an attendance of some two hundred master bakers.

Using the technique of filming through a microscope the film showed the reaction of various mixes to heat and demonstrated deficiencies and virtues resulting from various mixes and temperatures. These offered a novel viewpoint to the bakers who had not before seen the behaviour of ingredients so graphically and colourfully demonstrated.

The film reveals interesting possibilities for future productions along the same lines, and if and when that were done the trade technicians' viewpoint might be considered. The view has also been expressed that such films could benefit by permitting periodic stoppages, so that a discussion could be staged while the evidence was there to be seen. A further advantage would be the presence of an authority on the subject who could expound on the film and thereby add to its value.

Industrialists and technicians are tending towards the same attitude as educationalists, in that the mere screening of a film at normal speed and with sound is not the most valuable offering. In the same way as educationalists insist on films designed for their needs so must those designed for technicians, bakers, or engineers, follow along the lines dictated by their needs.

## A New Vegetable Oil

Reports from South Africa on the potential use of *Strychnos innocua*, a plant rich in oil of high quality for nutritional and industrial purposes, will be welcomed in view of the present scarcity of edible oils.

Reputed to have an average yield per acre double that of groundnuts with lower production costs, the species is being cultivated in Tongaland in the extreme north-east of Natal, where 5,000 acres have been devoted to its growth, while an additional 75,000 acres are available in adjacent territory for immediate development as required. If the whole acreage be ultimately called into service, it is estimated that the aggregate output from these 80,000 acres would amount to 24,000 tons of oil and 64,000 tons of cattle cake. This estimate is based on an output of 300 tons of oil and 800 tons of cake per annum for each thousand acres.

The total quantity given applies only to the specific locality named, it being possible that extensive areas in the Transvaal and other parts of the Union may be equally suitable for cultivation.

Interest in this plant lies not only in the claim that its yield per acre is so much greater than that of the groundnut, but that the quality of the oil obtained from it is as good.

## Non-Brewed Vinegar

A decision of interest to manufacturers, wholesalers and retailers of non-brewed vinegar was made by the Sittingbourne (Kent) magistrates recently when ten summonses relating to the sale of vinegar which, the prosecution alleged, had been adulterated by the addition of water were dismissed. Counsel for one of the defendants pointed out that there was no specific standard as to quality laid down by law. The county analyst had based his report on his own standard of at least 4 per cent. acetic acid content, but that was only an opinion and not a statement of fact. The Acting Chairman, after a short retirement by the Bench, said it was considered that the analyst's report was a statement of fact relating to the contents of the bottle. There was no standard fixed

by law for imitation vinegar. It had no food value and was really an imitation of a genuine article, and there was no offence committed by selling a genuine article of low quality. He felt that the defendants really had no case to answer because there was no standard laid down by law for imitation vinegar.

## Glass Containers

Two statements on glass containers, made recently in the House of Commons by Ministers of the Crown, appeared to many people to be contradictory. They were, in fact, complementary.

First, Dr. Edith Summerskill, Parliamentary Secretary to the Ministry of Food, said that there was now no shortage of milk bottles. A few days later Mr. Harold Wilson, President of the Board of Trade, said that the shortage of soda ash, a raw material used by a number of industries, was limiting the output of glass containers and the demand for jam jars was still unsatisfied, although the output recently had been nearly ten times the pre-war figure.

One leading manufacturer of glass containers agrees with both statements. The demand for milk bottles was being met, he said, because of (*a*) the priority given to them and (*b*) the smallness of the ration. Milk bottles of one-third, one-half, and pint sizes were being produced in quantity. The demand for quart bottles was diminishing; moreover, they interfered with production. If the milk ration were substantially increased there would be an increased demand, particularly for pint and quart sizes, and a shortage of bottles might again be experienced.

Few industries have felt more keenly the shortage of glass containers than soft drinks manufacturers. Many retailers still decline to serve a customer unless an empty bottle is returned, and the Soft Drinks Industry Association's instruction on the point is still being observed.

## Popcorn Study

It is strangely enough in an English journal, and not in an American, that there appears a study of popping and non-popping varieties of maize, the first scientific study ever published. In the *Journal of the Society of Chemical Industry*, A. Herzka has gone further than merely giving moisture content as the essential factor for popping, by telling us something of the actual mechanism as shown by illustrations of cross-sections obtained. It seems that excess sap in the leuciderm on conversion to steam exerts a pressure resisted by the surrounding tissues containing starchy gluten. But as soon as the cell sap adsorbed by starch grains of this starchy glutenous layer is converted in turn into steam, then pop goes the corn like the weasel of nursery rhyme. Mr. Herzka goes on to show how popping takes place at the apex of the kernel and not at the micropylar end. He shows, too, how the circular outline of the grain, with leuciderm equidistant from pericarp, and with embryo not extending beyond half the overall length of the kernel, is also an essential factor in this process adopted on such a wide scale in the United States. A list of non-popping varieties like the flint maizes of Argentina and Manalta, like sweet corn such as Carter's Golden Bantam and Early Golden Market, supports the explanation, since these are deficient in the above factors. All of which would seem in our country to revive thoughts of a sweetmeat known only in our boyhood, were it not for those American parcels we relish in these hard times. Tins of popcorn, complete with full directions for popping, will now be looked forward to, even for the preparation, now we are armed with Mr. Herzka's points. Of course, if a tin of Golden Bantam comes our way too, we shall at least open it in anticipation of serving it *à la casserole*.

## Aluminium Scare

In the correspondence columns of a Sunday newspaper there is raised once again the old bogey of aluminium cooking utensils as a danger to health. This theme of "Death in the Pot" is one ever cropping up, simply because the layman has not read the definite evidence against such a danger in the kitchen at home or in hotel or restaurant—or in food factory where processing in aluminium is so well established. The work of Mackenzie published in the *Biochemical Journal* for 1932, the review of Burn in *The Analyst* for that year, and the review of the Mellon Institute for Industrial Research—all are in vain unless publicity can be brought to bear. Fruit juices and apple sauce prepared in aluminium vessels certainly introduce a moderate intake of the element. But what of it? The one decisive point which all protagonists of this "danger" ignore is the considerable intake as aluminium hydroxide (so readily soluble in the stomach) which thousands of Service personnel and civilians have experienced when treated for duodenal or gastric ulcer. Some of these patients must have swallowed the equivalent of one or two kettles or pans; most of them have improved in health and are reported to be in rattling good condition!

# Vegetable and Fruit Canning in Norfolk

Founded in 1931, Norfolk Canneries Ltd., of North Walsham have made notable progress. In addition to the original factory at North Walsham, a smaller one has been in operation at Thetford, at which place still another factory went into production in 1947.

UPWARDS of 400 people are employed at the North Walsham factory during the summer and autumn months, two-thirds of whom are female and the remaining third male.

One feature deemed of great importance by the company is its close collaboration with the growers of the produce. Personal touch is maintained by frequent visits of the growers to the factory, during which discussions are held on such matters as varieties and quality of the different crops.

The Field Department, with its five Field Officers, whose function is to purchase the produce, is also in constant contact with the growers, and has done valuable work in encouraging the production in Norfolk of fresh and dried peas and in the expansion of the growing of soft fruit for canning. The company has accounts with considerably over 1,000 growers, and has its own sales organisation in London, which distributes its products on a national scale.

### Factory Layout

The layout of the factory allows for switching over from one line to another, thus rendering it exceedingly versatile, and all types of fruits and vegetables are handled in their due season.

The water for the factory comes from a bore providing 2,500 gal. per hour, and supplements the substantial volume of water provided by the local authority. This water is treated by a plant with a maximum capacity of 3,500 gal. per hour. Steam is provided by a Lancashire boiler, 30 feet by 8 feet, which is in the course of conversion for use with oil fuel. At times of peak demand a further Cochrane boiler is brought into commission.

### Maintenance and Welfare Departments

A maintenance department with over a dozen skilled men under a chief engineer forms part of the organisation which, in addition to keeping the plant in first-class running order, also constructs many items of its own plant, including plant of its own design.

The welfare of personnel has not been neglected, and the existence of a happy atmosphere is particularly evident to any observant visitor. Canteens, first-aid rooms, rest rooms for the female operatives, and the provision of wireless are some of the amenities provided by this department.

### Training within Industry

The company co-operates with the Ministry of Labour, and is training several young men under the Business Training Scheme. These trainees undergo a two years' course which takes them through all departments, by which means a supply of competent executives is built up.

The importance of quality control is particularly stressed by the administration. The laboratory is staffed by several fully qualified chemists, and cans are taken for complete examination every half hour. None of the company's products may leave the factory without a release note from the laboratory, and this is not issued until full incubation and bacteriological examination of representative samples of individual batches of the canned goods have been satisfactorily concluded.

The factory is engaged in the canning of fruits and vegetables, beans in tomato sauce, spaghetti in cheese and tomato sauce, the pulping of fruit, and other products according to season. Other im-

**After topping and tailing, the rhubarb is washed.**

portant activities are the canning of processed peas and the preparation and sale of dried peas, which are sold in bulk to the amount of several thousands of tons per annum. Bottling of fruit is also carried out during the season.

### Fruit Canning

During the season large quantities of rhubarb are canned. After topping and tailing, the rhubarb is washed and cut into pieces about one inch long by feeding into a cutting machine. Following a two-minute blanch the rhubarb is packed into cans by hand, after which the usual operations of syruping, exhausting, closing, and processing are carried out.

In a normal season the company handles more than 1,000 tons of plums, but unfortunately pre-emption of soft fruit for the jam industry has considerably reduced the quantity canned. During the autumn months canned apple *purée* is also produced.

Among speciality packs are blackcurrants, which are packed in A.10 cans for subsequent manufacture into *purée* for children, under the Ministry of Food scheme.

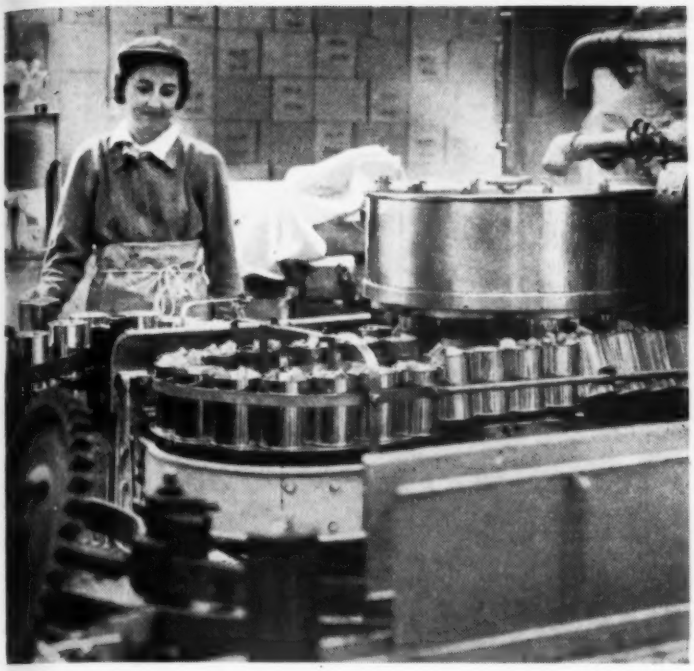
### Pea Canning

Several pea viners are in operation at growers' premises during the fresh pea season. The peas are harvested when the pods are swollen, the viner removing the pods while still attached to the vines. As soon as the shelled peas reach the factory they pass through a cleaning machine and then through a grader, which separates them into their various sizes. After this stage the peas are blanched in hot water and washed again. The peas next pass to a filling machine, which not only fills them into the cans but also adds the covering liquid: From the filler the cans pass to the sealing machines and then into the retorts for sterilisation. On the completion of this process the cans are well cooled. The company cans several hundred tons of peas each year.

**The rhubarb is cut into pieces about one inch long.**

**RHUBARB**

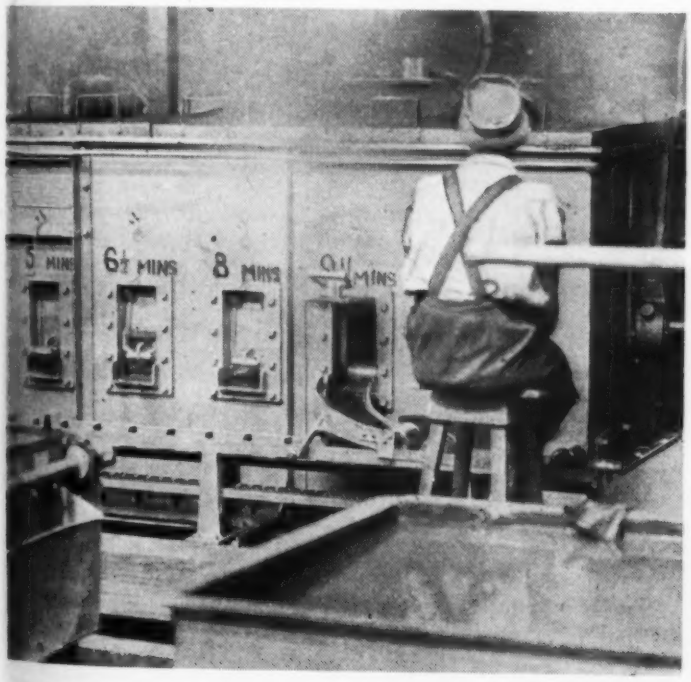
**Following a two-minute blanch, the rhubarb is fed into cans by hand.**



The cans are filled from the syrup vessel and the level is checked.

## CANNING

The cans are placed in the retorts for processing and are then cooled.




### Dried Peas

In a separate department dried peas from local growers are handled from September to April. The handpicking of dried peas provides employment for large numbers of female workers when neither fresh fruit nor vegetables are available for canning. After hand sorting and dressing the peas are soaked overnight in water in tanks and the soaking water drained off in the morning. The peas are then given a preliminary heat treatment in boiling water for about three to five minutes and then cooled. The peas are filled into cans, covered with hot brine, and are then passed through an exhaust box in order to bring the temperature of the contents up to about 180° F., and the lids are then spun on. The cans are processed in the retorts under pressure at about 240° F. for thirty to forty minutes, after which they are cooled and ready for labelling.

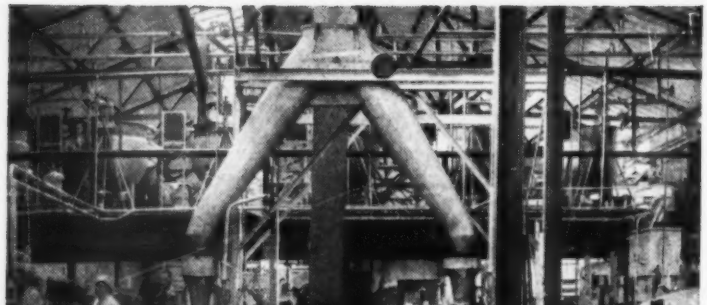
### Out-of-Season Work

During the same period such products as beans in tomato sauce are canned. The beans are soaked, then either blanched or oven baked and filled into the cans. The tomato sauce is added hot. The cans are then closed and placed in the retorts.

Beets and carrots are also canned during the autumn months, the company processing several hundred tons of the former and over 1,000 tons of the latter.

Thorough washing is necessary in the canning of beets, and in some cases the beets are allowed to stand in water for a time to soften the soil which may be adhering to them. To facilitate peeling, the beets are steamed in a retort for about ten minutes at a temperature of 220° F. After peeling the beets are placed in cold water, but to preserve the colour they are canned as quickly as possible. The covering liquid is a brine which is added hot. Processing time is 240° F. for forty minutes. Much the same procedure is followed in the canning of carrots.

Further departments handle cauliflower brining for the pickle

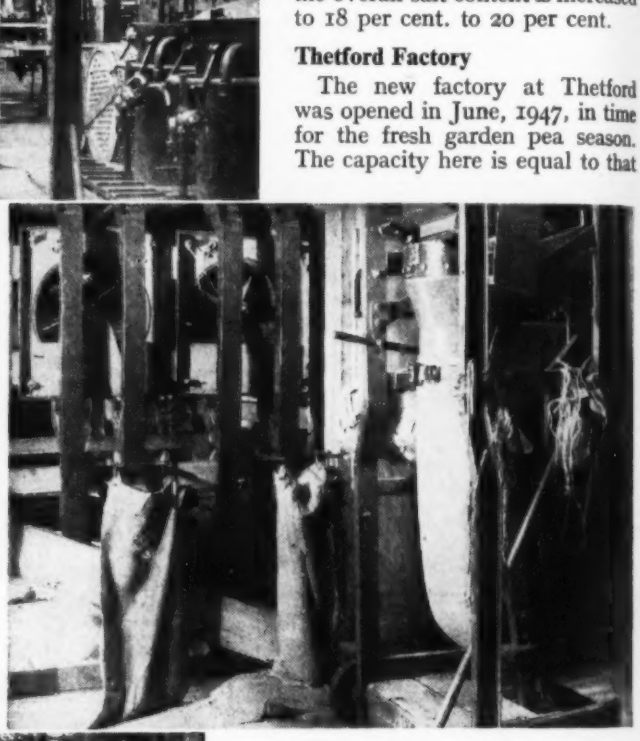


trade. Following the removal of the white and the green outer leaves, the heads are placed in a 60° brine and the fermentation, which would normally be set up as the brine strength is reduced by water diffusing out of the cauliflower, is prevented by frequent additions of solid salt to maintain the brine at 60°. If the fully cured flower is intended for storage the overall salt content is increased to 18 per cent. to 20 per cent.

**Thetford Factory**

The new factory at Thetford was opened in June, 1947, in time for the fresh garden pea season. The capacity here is equal to that

**Above: The twin-feed hopper in the centre foreground is for peas and beans, and leads to two automatic filling machines; the retorts are shown at the right. The syrup kettles can be seen in the gallery.**



**Right: The dried peas, after passing through the cleaning machine, are then sorted in the machine seen in the background of this photograph. In the foreground is shown the bagging of the peas, which are sold in bulk to the amount of several thousand tons per annum.**

**Below: In orderly array are stacked the canned products in the packing department where they are packed in cartons ready for despatch.**

at North Walsham, viz. over 300,000 cans per week, and the plant is similarly versatile. Some 200 people are employed at this factory together with a fully qualified laboratory staff.

SUPPLIERS OF EQUIPMENT

Cans: *Metal Box Co., Ltd.*
Water-softening plant: *Permutit Co., Ltd.*
Boiler: *S. Adamson and Co., Ltd.*
Pea sorter: *Simplex.*

A large amount of the equipment in use in these factories was manufactured in the Company's own workshops.

*Photos: Leonard Hill Limited.*

# Food Analysis

**Progress in 1947**

D. W. GROVER, F.R.I.C.

ALL analysts must have pondered occasionally on the advantages and disadvantages of having available a set of standard methods. The great advantage is that by the use of a standard method the degree of agreement between different analysts examining the same sample is greatly increased. The great disadvantage is that a standard method tends to become fixed; to remain in use after better and more convenient methods have become known. A second disadvantage is that a standard method is normally a precise method requiring more time and skill for its application than are commonly available in industrial, or even consulting and public analysts' laboratories.

### Standardisation of Methods

Consulting and public analysts have two requirements: precise reference methods, and sufficiently accurate rapid routine methods. The industrial chemist requires in addition very rapid sorting tests to assist in quality control. Where does the standard method fit into this picture? Obviously the sorting test is not subject to standardisation, nor is there need for it to be so. It is entirely for internal use. The precise and rapid routine methods can, however, be standardised with advantage with some important provisos: (1) that the body sponsoring the standard method is competent and representative, (2) that a sufficient number of collaborative analyses are made before the standard method is adopted, and (3) that the standard method and alternative methods are kept under continual review.

The standard method is adopted more generally across the Atlantic than in this country. An excellent example, which is well known to all food analysts, is provided by the "Methods" of the Association of Official Agricultural Chemists. Although certain methods have retained their standard status in this series beyond their utility, the Association has pursued a policy of continual review, and of reporting on its methods, which has successfully prevented stagnation. The whole success of this procedure depends upon collaborative work, and frequent issue of editions to a degree which could probably not be achieved in this country. British analysts, through the S.P.A. and other publishing societies, have maintained an output of high standard, reliable and original analytical methods. Recent moves on the part of the S.P.A show an increasing aliveness to the need for standard methods, and it is to be hoped that this body will receive full support in the form of laboratory work.

### Dairy Products

The sure foundation of the Hortvet freezing point as an index of added water in milk is emphasised by a collection of data published in a review by Macdonald.[1] From a very large number of determinations the limiting depression is confirmed to be 0·544° C. for bulk milk and 0·530° C. for milk from individual cows. Mastitis does not affect these figures materially, and corrections are available for acidity and decomposition developed during storage. Further physical data for milk, which should have application, are the refractive index and refractive constant.[2]

A comparison of standard methods for fat determination[3] led to the following conclusions:

1. The Röse Gottlieb method gives rather high results owing to the oxidation of the fat by peroxides in the ether, and to incorporation of non-fatty solids.

2. The Gerber method gives rather low results, which can, however, be corrected.

3. The Weibull (official Dutch) method can be adapted to give accurate results for a wide variety of dairy products.

The Weibull method involves acid digestion, filtration, with retention of the fat on a wet filter paper, oven drying of the paper and contents, and petroleum ether extraction.

The production of reducing substances when milk is heated above a certain temperature is well known, and they are assumed to have a useful function in retarding oxidation of milk dried after a sufficient degree of pre-heating. Lea[4] has proposed a more precise method for estimating these reducing substances, based on Chapman and McFarlane's ferricyanide method. He suggests that, since these reducing substances are probably of the nature of carbohydrate-protein condensation products, the method could be applied to other foodstuffs subject to spoilage by the formation of these compounds.

Sampling dairy products is not an easy procedure. It is to be hoped that the British Standards Institute Committee now considering this matter will assist in this. An apparatus for mixing samples of butter is of interest in this connexion.[5] It consists of a shaped blade which is inserted into a sample jar in such a way that good contact is made with the shoulders and bottom of the jar. The jar is then revolved mechanically until thorough mixing is achieved.

The refractometer can be used with a great saving of time for measuring the solids content of a variety of foods. Solids in egg white, soluble

solids in dried whole egg[6] are examples. Slightly different formulae are applicable to these products.

Of purely academic interest in this country at the moment is a method for estimating the degree of contamination of egg white with yolk.[7] Fats are extracted with ether, the cholesterol separated with the unsaponifiable matter, and estimated from the colour produced with an acetic anhydride/sulphuric acid reagent.

**Fruit and Vegetables**

Methods of analysis of citrus juices published recently include those for dissolved oxygen, citrus oils, and glucosides. Dissolved oxygen can be estimated polarographically,[8,9] using an applied potential of −0·4 volts. An accuracy of ± 3 per cent. on oxygen contents down to 0·02 per cent. is claimed. Citrus oil is determined by collecting it on pulped filter paper, washing and extracting with petroleum ether.[10]

Of interest to manufacturers of marmalade and grapefruit products where bitterness is a factor which should be controlled is the estimation of citrus glucosides.[11] The method—a general one for flavanones—is based upon the colour development in the system flavanone/alkaline diethylene glycol, and is applicable to the fruit, fruit juices, etc.

The sampling of frozen fruit is made more difficult by the tendency of the solid fruit to go towards the centre of bulk packages, while the juice collects at the bottom and sides. This movement takes place during the freezing operation, and is caused by the growth of the ice crystals. Methods and tools for sampling must take this into account.[12]

**Oils and Fats**

A considerable number of chemical tests for evaluating oxidative spoilage of fats have been proposed, and it is not always clear how well these correlate with the flavour change of the fat. A comparison of some of these tests with odour ratings is therefore of considerable value.[13] The results of such a comparison were as follows:

| *Chemical Method.* | *Correlation Coefficient with Flavour Rating.* |
|---|---|
| Peroxide value (iodometric) | 0·90 |
| α-dicarbonyl test[14] | 0·85 |
| Stamm test | 0·82 |
| Kreis test | 0·81 |
| Peroxide (ferrometric) | 0·80 |
| Fluorescence | 0·79 |
| Fatty acids | 0·10 |

Since the peroxides are not stable in oxidised fat, it was considered that the α-dicarbonyl test is the most satisfactory.

As a means of determining the end-point of the Swift stability test it is proposed that a measurement of the refractive index should be employed instead of, for instance, chemical estimation of the peroxide value.[15]

A semi-automatic stability test for oils and fats has been developed by the staff of General Foods, U.S.A.[16] It is based on a scale recording of oxygen absorption at constant pressure. The induction period, indicated by an inflection of the curve, can be estimated to within ± 5 per cent., and corresponds satisfactorily with the flavour change.

Details of a method for determining the oxygen content of fats and oils have been published in Australia.[17] After removal of the surface (*e.g.* of butter) under oxygen-free water the sample is transferred to an oxygen-free apparatus where it is melted and swept free from oxygen with a stream of nitrogen. The oxygen is absorbed on copper moistened with ammonium chloride and the copper oxide determined colorimetrically.

Improvements in technique have been described relating to (*a*) ultra-violet absorption methods for determining the number of conjugated double bonds in unsaturated fats and oils,[18] and (*b*) the determination of acetyl numbers by heating with acetic anhydride.[19]

**Sugars and Starches**

Chromatography is likely to prove a very useful tool in solving the problems of the separation and estimation of sugar mixtures. An absorbent material which has proved to be successful for this purpose is a synthetic hydrated calcium acid silicate known as "Selene E.F."[20]

The sampling of raw sugar is of great economic importance as small differences in analysis can have a great bearing on the value of a shipment to the refiner, and on the calculated efficiency of the refining operation. The sampling procedure of sugar cargoes has been studied by testing different ways of drawing samples and making a statistical examination of the results.[21] The method recommended as a result of the work is to draw one sample, by means of a modified trier from one bag in seven, to mix and to reduce the sample size in the usual manner before analysis.

The colour of the starch/iodine complex varies according to the ratio of amylose (clear deep blue colour) to amylopectin (purplish colour). By measuring this colour the ratio can be determined with greater accuracy if the starch/iodine ratio is kept low.[22] It is desirable to measure extinction coefficients at 610 mμ as this is the wavelength of maximum absorption. If possible the ratio should be calculated from the extinction coefficients of amylose and amylopectin derived from the sample under investigation.

It has long been known that starch granules vary in their ease of rupture with cold alkali. Maize and rice starches, for instance, are not ruptured by cold 1·8 per cent. potassium hydroxide solution, whereas wheat starch is. These facts are made use of in a proposed method for determining maize and rice flours in admixture with wheat flour.[23] After alkali treatment the unruptured starch granules are centrifuged off and weighed.

## Preservatives and Flavours

Increased accuracy can be achieved in the direct titration of sulphur dioxide with iodine by replacing the visual end-point by an electrometric indicator.[24] The electrometric indicator system comprises a bright platinum electrode, a reference electrode of the Ag/AgCl/KCl type, and a high resistance galvanometer. Titrations are made in the absence and presence of acetone, and the sulphur dioxide content is calculated from the difference figure. It is claimed that this modified procedure reduces the error in deciding the end-point from 0·2 ml. to 0·05 ml.

A micro method[25] for determining saccharin involves the following steps: extraction of the acidified sample with ether, hydrolysis of the ether extract with 5N hydrochloric acid, and micro-estimation of ammonia. Correct conditions have been worked out for the acid hydrolysis. A modification of the hydrolysis procedure is proposed in another recent method for determining saccharin in soft drinks.[26] The method proposed is based on the B.P. (1932). Hydrolysis is effected by refluxing firstly with caustic soda and then with hydrochloric acid.

The determination of DDT in fatty foods, using the original procedure of Schechter (*Ind. Eng. Chem.* [anal.], 1945, **17**, 704), is rendered inaccurate owing to fatty material extracted along with the DDT interfering with the nitration of the latter. Two ways of overcoming this difficulty have been proposed. In one[27] the fat and DDT are first extracted with a fat solvent, the solvent is removed, and the extract is taken up in chloroform. The chloroform solution is extracted with sodium sulphate dissolved in sulphuric acid. This solution dissolves the fats and leaves the DDT, which is nitrated and determined by the original spectrographic procedure. The second way of removing the fat[28] involves enzyme hydrolysis to fatty acid and glycerol. The nitration step is closely investigated to ascertain how much organic material of various kinds may be present before low recoveries of DDT result.

For the determination of DDT in spray residues three methods have been described[29] which give results in reasonable agreement. These are (i) estimations of total chlorine and chlorine removed by digestion with alcoholic potash in benzene; (ii) nitration, ether extraction, and removal of solvent followed by colorimetric estimation in benzene with sodium ethylate; (iii) removal of "labile" chlorine to give the corresponding ethylenes and oxidation to the ketones. These are estimated colorimetrically by coupling with dinitrophenylhydrazine. The third method is more tedious than the first two.

The first paper of a series which promises to be useful is entitled *The Chemical Microscopy of Essential Oils*, dealing with the distinctions between cassia oil, cinnamon leaf oil, and cinnamon bark oil.[30]

## Trace Metals

Low recoveries of copper by dry ashing as compared with wet ashing have been shown to be due to the formation of metallic copper insoluble in hydrochloric acid.[31] A previous explanation of these low recoveries was the formation of an insoluble copper silicate. The recommended procedure is to ash in a silica dish and extract with mixed hydrochloric acid/nitric acid reagent which readily dissolves copper. The copper may finally be determined with diethyldithiocarbamate.

A newly proposed reagent for copper giving a blue colour akin to that given with ammonia is tetraethylenepentamine.[32] The amine is non-volatile, while the blue colour is stable, independent of excess of reagent and obeys Beer's Law. Interference by other metallic ions is the same as for the copper/ammonia colour.

Conditions for determining copper by extractive titration with dithizone are described in a German paper.[33] Details of the proposed method are given in the *Analyst* and *British Abstracts C* (1947, 2).

A micro-method for boron estimation is given in a recent paper, of which a detailed abstract is available.[34] The sample is ashed, the ash extracted with phosphoric acid and refluxed with methyl alcohol. The ester so formed is distilled and determined colorimetrically with curcurmin.

A very sensitive method for determining tin in foods—as little as 0·5 p.p.m. on 10 g. being claimed—has been based upon the electrolytic change of stannic ions to stannous ions as observed polarographically. A special cell, with an external calomel reference cell, was devised for this reaction.[35] The sample is wet ashed, the tin separated as hydroxide, centrifuged, and taken up in ammonium chloride/hydrochloric acid. Lead, the only likely interfering metal, is corrected for by polarographic analysis in an alkaline medium.

A critical study of methods for estimating the weight of tin coating on tin plate has been published by the Society of Chemical Industry.[36] Five methods were tested, four being based on loss of weight by stripping. The reagents used were (*a*) Clarke's solution (antimony trichloride-hydrochloric acid), (*b*) sodium plumbite solution, (*c*) alkaline potassium iodate solution, and (*d*) sodium bismuthate solution. The fifth method was iodometric titration of the tin after complete solution of the plate in acid. Of the first four only Clarke's solution was satisfactory for all kinds of tin plate. Alkaline potassium iodate was satisfactory for electrolytic plate only. Iodometric titration after complete solution is accurate only if the iodine consumption of the baseplate can be corrected for. It is proposed that this should be done by determining this factor on the baseplate after stripping with Clarke's solution, which dissolves tin from the alloy layer in addition to the unalloyed surface tin.

In using the "mixed colour" dithizone method for estimating traces of lead, difficulties have been

encountered due to the interference of the excess dithizone with the colour given by the dithizone/lead compound. The dithizone is principally present in an aqueous phase, whereas the lead compound is concentrated in an organic solvent. Interference is caused by some dithizone being dissolved in the organic solvent. To minimise this it has in the past been necessary to use only a very small excess of reagent. It has now been found[37] that by making the extraction at a higher *p*H, viz. 11·5 instead of 9·5, this interference is greatly decreased, and a reasonable excess of dithizone reagent can safely be used.

The conditions for obtaining satisfactory results for lead, using a polarographic method, have been investigated.[38] The recommendations given are that (*a*) all organic matter should be removed with perchloric acid, (*b*) ferric ion should be reduced to ferrous iron with hydroxylamine hydrochloride, (*c*) interference by other ions should be minimised by making the test at *p*H 2·5 to 3·0. Under these conditions the copper, tin, zinc, and arsenic half-waves are sufficiently removed from that of lead. The diffusion current is affected by the viscosity, which, in turn, is almost entirely governed by the concentration of sodium sulphate originating when the sulphuric acid from the wet ashing is neutralised with sodium hydroxide. By observing the amount of sodium hydroxide required for this purpose and reading a "viscosity factor" from a graph provided, effects due to variations of viscosity can be compensated for. The accuracy claimed is 10 per cent., except when the lead is less than seven parts per million, when rather lower accuracy is achieved.

Convenient rapid tests for added iron[39] in flour are based upon the use of colour reagents: (*a*) the mauve iron lake of alizarin, and (*b*) an improved thiocyanate reagent incorporating ammonium persulphate to accelerate the conversion of ferrous to ferric ions. The alizarin test is carried out as follows: Alizarin test papers are prepared, wetted with acid, and the flour sieved on to the surface. After a period, the paper is inverted over ammonia to neutralise the acid and the ammonia is discharged by evaporation. Iron, if present, is evidenced as localised mauve spots.

## Physical Methods

New and improved physical methods of analysis continue to attract attention and, indeed, some controversy. Analysts whose pockets are of limited depth complain that undue attention is devoted to methods involving the use of expensive apparatus. The contrary view has quite naturally been expressed with approximately equal frequency. Advances in electrometric analyses have been discussed by Lauchlan[40] and Carter,[41] and fluorimetry by Bowen[42] and Kodicek.[43]

Details have now been published of the method of density measurement using a column of liquid varying in density from top to bottom. As applied for measuring the density, and hence the solids, of sugar solutions, the liquids used are a petroleum fraction (density 0·75) and bromobenzene (density 1·49). These are partially mixed by a procedure described fully in a British abstract.[44] Drops of the test liquid (density 1·01 to 1·06) are allowed to fall through a cylinder of this liquid and take up a position according to their density. An accuracy of ±0·0001 S.G. is claimed.

## Miscellaneous

Distillation of ammonia is eliminated in a modified Kjeldahl method for determining nitrogen in organic material.[45] The sample is treated with sulphuric acid, potassium sulphate, etc., as usual, the flask and contents allowed to cool and neutralised to methyl orange. Ammonia is titrated with N/10 sodium hydroxide solution in the presence of an excess of formaldehyde, using phenol phthalein as indicator. The formaldehyde forms hexamethylenetetramine with the ammonia and liberates an equivalent amount of acid.

Several methods have been proposed for measuring moisture content by means of the reaction between calcium carbide and water. An interesting example of these, applied particularly to cheese, is based upon the loss of weight occurring when this reaction takes place.[46] 10 g. of the sample and 5 g. of finely powdered calcium carbide are allowed to react in a beaker for five minutes in a boiling water bath and the loss of weight observed. The presence of 1 g. of water causes the loss of 0·72 g. of acetylene.

The presence of gas in the headspace of vacuum packed foods may be due to incorrect closing conditions, evolution of gas by the food, or leakage. Apparatus for collecting, measuring, and analysing such gases has been described in a U.S. journal.[47] The methods are similar to those employed in this country.

Recent papers have dealt with the biological[48] and mathematical[49] aspects of microbiological determination of amino acids.

The mucilage cells of common varieties of mustard may be distinguished by their microscopic appearance in polarised light.[50] The sample is mounted in 60 per cent. glycerol. Under these conditions white mustard shows numerous large crosses (48μ) other varieties show a similar effect to a lesser degree, while black mustard shows no crosses.

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(*Concluded on page* 157)

# Food Transport by Sea

THE provision of ultra-low temperature storage for the transport of foods by sea was discussed by A. J. M. Smith of the Refrigerated Cargo Research Council and J. D. Farmer of J. and E. Hall, Ltd., in their paper on the developments in frozen foods and their effects on the design of ships' refrigerating equipment in Glasgow on February 10.

It was emphasised that frozen foods, in the wide sense, were the first and are still the most important of the cargoes carried in refrigerated ships to this country. The recent developments, which are of particular interest to those concerned with marine refrigeration, are in the main related to improved methods of freezing and storage, which have made it possible to extend the range of frozen commodities, to improve their quality, and to offer them in suitably packaged forms which eliminate inedible waste and reduce labour. Many such frozen foods are now being prepared on a fairly large scale, either in retail packs for the domestic consumer or in larger containers for institutional use and for various food manufacturing industries. They include fish (which may be frozen whole, filleted, or in the form of steaks), poultry, eggs, fruits of many kinds (largely for the processing industries), and vegetables (chiefly in small packages for the retail trade).

Frozen packaged meats are still in a developmental stage. A possibility of particular interest to shipowners is that at some future time a part at least of the meat carried from overseas to this country may be offered for shipment in this form, and on a scale which would call for a major reconsideration of the design and equipment of refrigerated ships.

Apart from such possible changes in freezing and packaging technique it is likely that, as time goes on, lower carrying temperatures will be sought for some of the frozen commodities now carried overseas at about 15° F. It appears from a review of scientific findings that advantage would be gained by lowering the storage temperature for certain commodities, perhaps to 10° F. or 5° F., and the long-term preservation of frozen fish, in high-class condition, is likely to require temperatures well below 0° F. The degree to which sub-zero temperatures would be advantageous in carrying overseas the major frozen cargoes (meat, butter, eggs) in their present forms is, however, still uncertain. Moreover, shipowners cannot reasonably be asked to provide carrying temperatures lower than are considered necessary for storing the same commodities before and after the relatively brief period which they spend on board ship.

In each instance the advantage secured must be weighed against the heavy cost of providing storage space at ultra-low temperatures, especially in ships where the weight and space required by the additional refrigerating machinery and insulation are important factors as well as the first cost, and where it is essential to maintain versatility so that one and the same space can be used for various cargoes at different times.

A detailed analysis of requirements for the maintenance of sub-zero temperatures in part or all of the refrigerated space on a typical cargo liner was given by the authors of the paper.

The increased costs for maintaining low temperatures would sometimes be offset by the fact that the storage volume required for a given weight of edible food in frozen packaged form would be considerably reduced.

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## Food Analysis

(*Concluded from page* 156)


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# Tomato Juice

PROF. W. V. CRUESS

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Canned tomato juice has become one of the most important American unfermented beverages. In comparison with bottled grape juice and apple juice, tomato juice is a relative newcomer. In 1928 only a few thousand cases of tomato juice were packed, and in 1929 the output had become 165,251 cases. In 1935 it was 8,170,640 cases, in 1945 it was 24,500,000 cases, and in 1946 the pack was 34,900,000 cases.

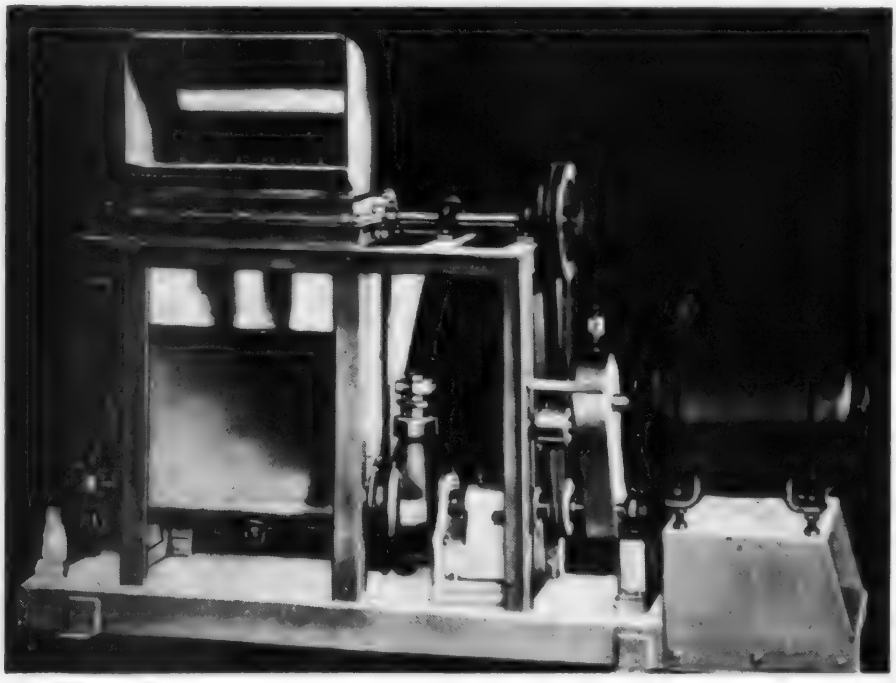
TOMATO juice is served most frequently as a breakfast beverage. It is also used as an appetiser at luncheon; if jelled with unflavoured gelatin it may be served on a lettuce leaf as a salad with mayonnaise; and it is often used as a base for home-made tomato soup with or without added vegetables, rice, and pearl barley. It is less satisfactory than tomato paste, *purée*, or hot sauce for flavouring of meat dishes since it is not so concentrated as these other tomato products.

**Dietary Value**

Tomato juice may be described as "filling, but not fattening," as it usually contains about 92 per cent. to 94 per cent. water.

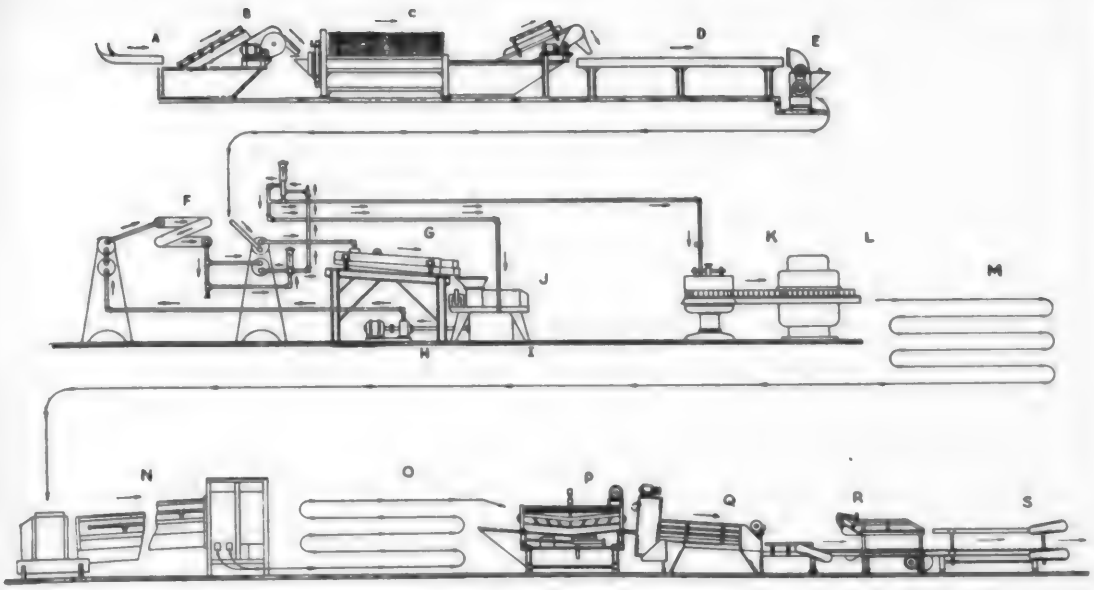
The composition of tomatoes and tomato juice varies materially with the variety of tomato, the locality where grown, and the time of year when picked. According to Saywell and Cruess (1932), tomatoes grown in a cool, foggy climate, such as that of the San Francisco Bay area, are of higher total solids and total acid content than those of the same varieties grown in a hot area of low humidity, such as the Riverside area in California. Those picked late in October during rainy weather were lower in total solids than those picked in September. The Stone variety was higher in total solids and acidity than the Santa Clara Canner. The former is grown commonly in the Eastern United States and the latter is the chief California variety. Analyses of Stone tomatoes grown in California showed higher total solids than analyses of the same variety grown in the Eastern United States and reported by others.

Chatfield and Adams report approximately 1·0 per cent. of protein (N × 6·25) in tomato juice.



**Tomato chopper and pump.**

*Photos and diagram courtesy Chisholm-Ryder Company, Inc.*




A. Flume.
B. Soaker washer.
C. Tomato washer.
D. Sorting and trimming table.
E. Chopper pump unit.
F. Preheating and high-temperature unit.
G. Shaker screen.
H. Positive pump.
I. Juice-holding tank.
J. Juice extractor.
K. Liquid filler.
L. Closing machine.
M. Holding conveyor.
N. Spinner cooler.
O. Drying conveyor.
P. Labeller.
Q. Caser.
R. Automatic case gluer.
S. Compression sealer.

Saywell and Cruess also found approximately 1·0 per cent. (0·97 average).

Mitchell found the *p*H value by glass electrode to range from 4·11 to 4·38. Saywell and Cruess reported *p*H values ranging from 3·8 to 4·4.

Its principal vitamin is ascorbic acid, which varies greatly according to the amount of oxidation occurring during preparation of the juice for canning. With excessive oxidation the juice may be practically free of ascorbic acid; with full precautions to prevent oxidation the vitamin C content may be as high as 35 mg. or more per 100 ml.

Tomato juice contains some carotene, present in the pulpy fraction. It also contains small amounts of $B_1$, $B_2$, and several other vitamins of the B complex. The food values chart of the H. J. Heinz Company gives the following approximate values for various food constituents of tomato juice: carbohydrates 3·4 per cent., calcium ·011 per cent., iron 4·4 mg. per 1,000 g., protein 1 per cent., vitamin A (carotene) 2,000 International units, vitamin C 27 mg. per 100 g., vitamin $B_1$ 80 micrograms, and $B_2$ 90 micrograms per 100 ml.

Saywell found in experiments with human subjects that the regular daily ingestion of tomato juice raised the *p*H value of the urine, an indication that its basic ash tends to increase or maintain the alkaline reserve of the blood.

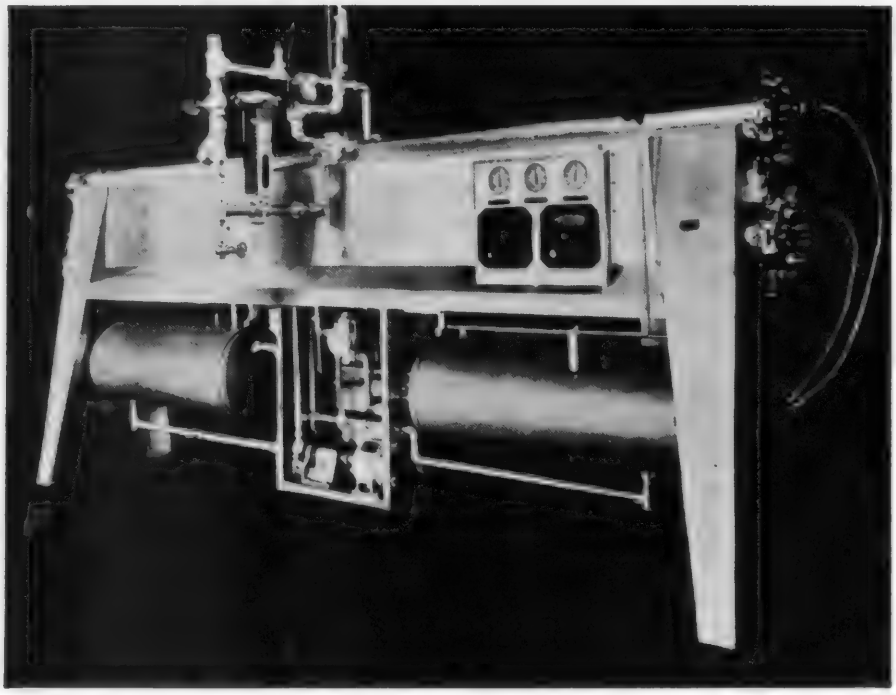
United States Food and Drug regulations define tomato juice as "the unconcentrated pasteurised product consisting of the liquid with a substantial portion of the pulp, expressed from ripe tomatoes with or without the application of heat, and with or without the addition of salt." Therefore, filtered juice cannot be labelled normal tomato juice.

In the early days of the industry some juice was filtered and bottled as a clear juice of amber colour. In so far as the author is aware this product is no longer packed in the United States.

**Tomato Varieties for Juice**

In the Eastern United States and Middle West the Stone variety, a tomato of medium size, smooth skin, excellent colour, rich flavour, and higher than average acidity, is popular for the production of canned tomato juice. In California the Pearson, a heavy bearing tomato of medium size, good colour, and smooth skin, is being used extensively for juice, although various strains of the Santa Clara Canner are still the most commonly grown varieties for canning and juice. The Santa Clara and the various strains derived from it by selection and crossing are of very large size, rather flat contour, solid flesh, and medium colour. Various other varieties are used according to locality, as climate, soil, prevalence of various tomato diseases, fresh market demands, preference of canners, and other factors affect the varieties grown in different sections of the United States.

The tomato canning season in central and



**The crushed tomatoes are preheated to 140°F. to 150°F.**

northern California usually begins about August 15, and unless early rains or early frost end the season, continues to about November 1. In exceptionally favourable years it may extend to November 25. In the Eastern United States and the Middle West frost usually kills the vines and thus ends the season early in October.

## Picking

Tomatoes are usually grown on contract by growers to whom the canner often furnishes the young plants. Where rainfall is sufficient the vines are grown in California without irrigation, but irrigation is usually practised. In the Middle West and East summer rains make irrigation unnecessary. The vines are grown without stakes or supports; hence they grow in sprawling fashion with much of the fruit borne in contact with or near the ground.

With present labour shortages it is often not possible to pick the tomatoes as frequently as the canner would wish. Picking in large plantations in California is usually done by itinerant crews; very often Mexicans or Filipinos. Pickers are paid either on a piece-work basis (by the lug box) or by the hour. Other things being equal, picking on a piece-work basis results in a larger tonnage picked per person, and lower picking cost per pound, but in poorer workmanship than if picking is on a set hourly wage, because the tendency under the piece-work plan is to "pick everything" at as rapid a pace as possible. Hence an undue amount of over-ripe and unripe and insect-infested fruit is apt to find its way into the boxes. The tomatoes are picked into buckets or baskets and transferred to 50 lb. fruit lug boxes. Rotten and insect-infested fruit is picked and thrown to one side. Only the sound, prime-ripe fruit is desired.

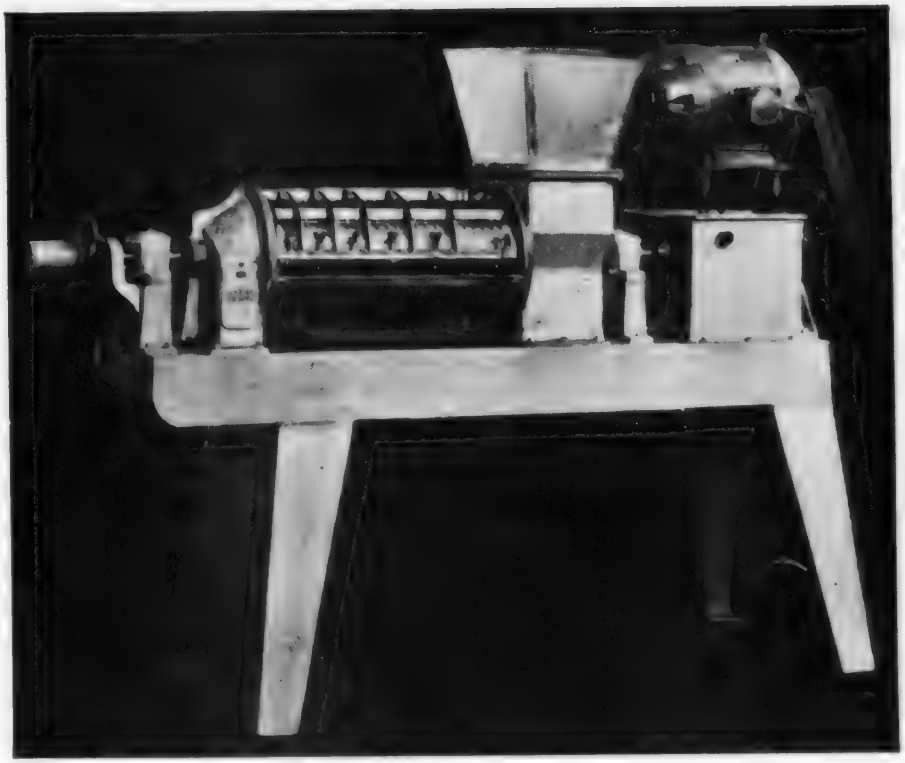
The cannery field representative usually supervises the picking and arranges the time of picking on various farms so that approximately the same tonnage is delivered to the cannery each day. He also should see that the quality of picking is satisfactory.

At the cannery the chemist or other member of the technical staff inspects the fruit for quality to see that it is up to contract specifications. In the Eastern United States tomatoes are often bought on U.S. grades, and inspection is by representatives of the Department of Agriculture of the State concerned. In California inspectors of the State Cannery Inspection Service inspect much of the fresh fruit for insect damage, rot, sun-burn, green fruit, etc. It must meet certain limits in respect to total defects, usually 15 per cent.

## Sorting

The boxes of tomatoes arrive at the cannery by truck, are transferred to pallets, and transported by lift truck to the box-dumping station. The boxes are placed on a conveyor and contents dumped into a tank of water by an automatic box-dumping machine.

The tomatoes are conveyed from the dumping tank through the washer. Modern washers use



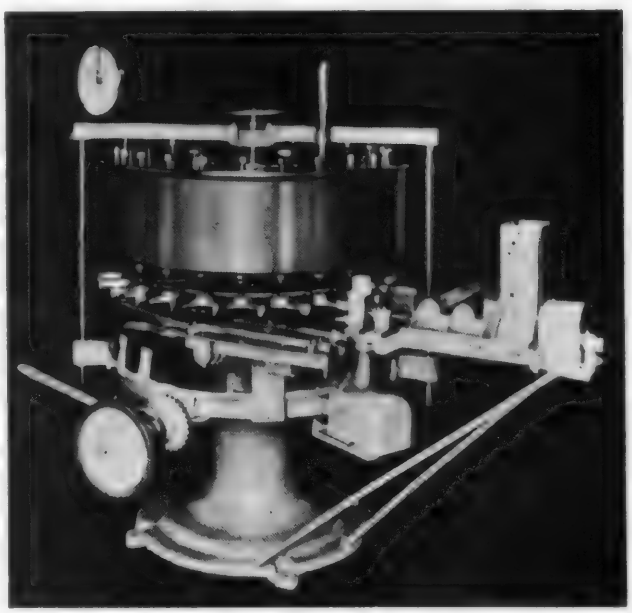
**The juice is expressed with much of the solid pulp through a fine screen or sieve.**

water sprays under extremely high pressure, at 300 to 400 lb. per square inch. The tomatoes may be conveyed through a shallow tank of water under the high-pressure sprays, or by roller conveyor under the sprays. The roller conveyor consists of stainless steel or bronze tubes about 3 inches in diameter and about 2½ feet long, placed crosswise on the sorting apron, the tubes turning as they are carried along the apron. The revolving tubes turn the tomatoes over and over beneath the sprays, resulting in thorough washing.

The roller conveyor apron serves as a very effective sorting belt beyond the washing section. Unfit tomatoes are discarded by the sorters; those requiring trimming are placed on a belt that carries them to the trimming crew. Perfect fruit is carried by the conveying belt to the crusher.

### Crushing and Preheating

The tomatoes are coarsely crushed or torn by machine so that they may be pumped to the preheater in most plants. In some, however, the crushed tomatoes go directly to the juice extractor.



**The juice is filled into No. 2 cans at 203° F. to 205° F.**

In most California plants the crushed tomatoes are preheated to 140° F. to 150° F. in a tubular, continuous flash heat interchanger of the Food Machinery Corporation or Chisholm-Ryder type. Some plants heat to higher temperatures, 180° F. to 190° F. As stated above, some producers do not preheat at all.

Heating increases the pectin content and thus improves the texture of the juice.

**Extracting the Juice**

The juice is expressed with much of the solid pulp through a fine screen or sieve. This may be done by worm conveyor turning inside a cylindrical or conical screen as in the American Utensil Company extractor; or by very rapidly vibrating screens, or by paddles or brushes revolving inside a cylindrical screen. If pressure is too heavy or if a very high yield is attempted by paddle-type extractor, the juice is apt to be coarse in flavour and poor in colour. Gentle pressing is recommended.

In several plants the raw crushed tomatoes are pressed without preliminary heating.

**De-aeration**

Kohman and others have shown that oxidation of vitamin C in raw tomato juice is very rapid, and that much or all of this vitamin can be lost if the juice is not de-aerated immediately after extraction; or, as an alternative, if the crushed tomatoes are not heated sufficiently to destroy enzymes before extraction. De-aeration is the usual procedure. This is done in one large plant in closed, heavy walled stainless steel tanks, one being filled under vacuum while the de-aerated juice in the other is being drawn off for canning. Generally, however, a continuous de-aerator of the design used for orange juice is employed. The hot juice is sprayed into the vacuum chamber (a vertical stainless steel cylinder) and is pumped from it under vacuum. The juice boils and gives up its dissolved air. A vacuum of 25 inches or higher is recommended. Vitamin C retention is good if de-aeration following extraction is prompt.

**Pasteurisation and Canning**

The de-aerated juice in most plants is next heated in a continuous tubular heat interchanger type of pasteuriser. In one up-to-date California plant the juice previously passed through a finisher is heated in a Food Machinery Corporation three-stage pasteuriser to 240° F. for about fifteen seconds, then held in the second stage for about forty-five seconds at 240° F., and then cooled in the third stage to about 210° F. It then flows to the can-filling machine where it is filled into number 2 cans at 203° F. to 205° F. and salt is added. The cans are sealed at once, and automatically turned end to end. They then travel in air on a belt conveyor for three minutes to allow the hot juice to sterilise the can and ends. The cans are then cooled under sprays of water, the cans being rotated rapidly beneath the sprays. The cooler used is that known as a "spin cooler" made by the Food Machinery Corporation and Chisholm-Ryder Co.

The cans cooled to about 100° F. travel by belt conveyor in air to dry the can surface, then roll by gravity through an automatic labelling machine to the fibre board cases in which they are packed for storage in the warehouse or for shipment to the trade.

In another plant the washed, sorted, and trimmed tomatoes are crushed; juice is separated by vibrating flat screens; additional juice is expressed by screw-type juicer; the combined juice is "finished"; vacuumised; flash heated to 250° F. for forty-five seconds; cooled to 210° F.; filled into cans; salt added; cans sealed; allowed to travel for about three minutes in air; and then cooled.

In still another plant the juice expressed from the raw tomatoes is "finished"; vacuumised; preheated to 190° F.; canned; salted; cans sealed; processed at 212° F. for twenty minutes; and cooled in water.

Another manufacturer heats the crushed tomatoes (previously washed, sorted, and trimmed) to 190° F.; extracts juice in a pulper-type juicer; passes the juice through a finisher; cans the juice; adds salt; seals cans in vacuum; processes at 218° F. and cools in water.

There are other variations and modifications in other plants. Thus, it can be seen that procedure varies considerably in the various tomato juice canneries in California.

**Spoilage**

Cameron was one of the first to show that tomato juice is occasionally spoiled by a heat-resistant, spore-bearing thermophilic bacillus that will survive a short process at 212° F. It imparts a "medicinal" or "phenolic" odour and flavour to the juice. He has given safe process times for tomato juice in cans of various sizes filled and sealed at 170° F. to 180° F. At this filling temperature the recommended times are for number 2 cans, twenty-five minutes, and for number 1 tall cans, fifteen minutes, and number 10 cans, forty minutes. However, as stated in the preceding section, it is now customary in most California plants to flash heat to 245° F. to 250° F. and fill the cans at 203° F. to 210° F., seal and give no further heat processing.

Townsend has found that *Clostridium pasteurianum*, a heat resistant, gas forming, anaerobic bacillus, may occasionally survive processing and cause spoilage of tomato juice. The process times recommended by Cameron and the present flash heating treatment described in the preceding section usually prevent both the "flat sour" spoilage of Cameron and the gaseous spoilage of Townsend.

Tomato juice is lightly salted, the usual salt content of the juice being in the neighbourhood of 0·5 per

cent. Formerly it was customary to add the salt to the juice in bulk in a glass-lined or stainless steel tank and stir until dissolved.

At present the salt is added to each can of juice just before sealing or to the empty can before addition of the juice. It may be added in the form of pellets or as granular salt; automatic dispensers are available for each form of salt.

Use of the salt dispenser saves considerable labour and ensures uniform salt content in the canned juice.

**Insect Fragments Count**

As most British canners know, there is in effect in the United States a food regulation requiring that various tomato products contain not more than specified maximum numbers of insect fragments per specified volume of product. For tomato juice the maximum number of fragments permissible is 10 per 200 ml. The counting procedure is that of Dr. B. J. Howard, as described in *Commercial Fruit and Vegetable Products*, by Cruess; and in publications of the U.S. Food and Drug Administration and National Canners Association. Briefly it consists in agitating a 200 ml. sample with 30 ml. of petrol acid water in a 2,000 ml. Erlenmeyer flask; separating the petrol fraction; filtering it and counting by binocular, low-power microscope, the number of insect fragments on the filter paper. It is more easily said than done, and requires training and experience.

In California the corn ear worm, vinegar flies, and tomato mites are the usual source of fragments. In going through the finisher a corn ear worm is broken into hundreds of fragments.

**Howard "Mould Count"**

A maximum tolerance for mould filaments has also been set by the Food and Drug Administration. For tomato juice it is required that there be not more than 20 positive fields (showing mould filament) per 100 fields examined under the low power of the microscope with a sample 1/10 m.m. in depth examined in a Howard mould-counting slide. In California, except toward the end of the season, it is less difficult to meet the mould tolerance than the worm fragment tolerance. In the rainy Mid-West and Eastern United States mould is apt to give more trouble than insects.

**Freezing of Tomato Juice**

Experimentally, the author has preserved tomato juice in cans by storage at 0° F. in comparison with juice of the same lot preserved by sterilisation by heat in cans and stored at 80° F. to 83° F. Raw tomato juice stored at 0° F. for twelve months developed a disagreeable hay-like odour and flavour, and considerable bitterness. It also curdled rather badly. That which had been heated to 212° F. to destroy enzymes did not change in flavour during two years' storage at 0° F.; nor did it curdle.

It was very much superior to the juice preserved by heat sterilisation and stored at 80° F. Even after three months' storage the difference in flavour was very noticeable.

However, commercially canned tomato juice is a very satisfactory product of low price (at least in the U.S.A., although rather expensive in London), hence there would seem to be no great call to preserve this juice by freezing.

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## Vitamin Assay

To promote and implement the standardisation of vitamin methods and to co-ordinate the widely scattered literature and reports of work is the purpose of a recently published book.*

Despite the improvement in chemical, physical, and microbiological procedures, there is still considerable uncertainty caused by differences in vitamin values found by different methods. Much of this confusion has arisen because details of procedure are frequently omitted from the original publications, thus leaving analysts to make their own interpretations of general directions and to contrive various original devices.

The procedures described in the book are not essentially different from official or accepted methods published elsewhere, but with the extensive notes incorporated with each method details are given which are frequently omitted from other descriptions. The background assumed is that of a laboratory technician with limited training in quantitative analysis, and the scope of the book has been limited to such methods as have been successfully applied to a variety of foods or other materials by several members of the committees of the Association of Vitamin Chemists, Inc. Thus, this book is intended more as a manual for the analyst than as a comprehensive treatise, and references to the literature have been included only when it was felt they might be helpful to the reader should he desire further information.

* *Methods of Vitamin Assay*. Prepared and edited by the Association of Vitamin Chemists. Inc. New York and London. Pp. 189+xviii. Price 21s. net.

# Co-ordinated Process Control in the Canning Industry

The adoption of co-ordinated process control in the canning industry is becoming almost general. Not only does it ensure that the high quality raw materials used in the canning industry are not damaged by the processing they receive from their entrance into the factory to their emergence in closed cans, but its use also effects a considerable economy of fuel.

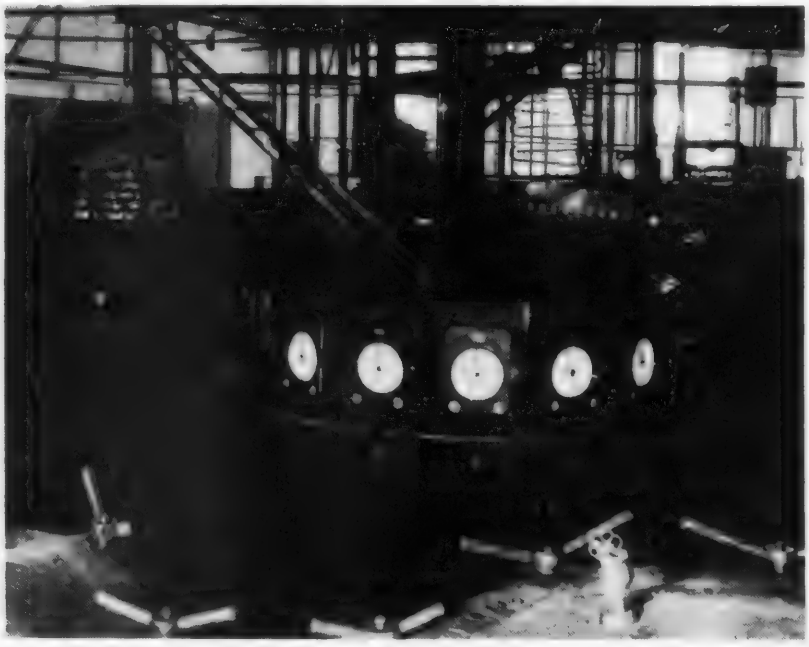
EQUIPMENT for use in the blanching process in the canning of vegetables may be classified roughly into three general types: (1) the immersion or conveyor type which employs either the screw or chain conveyor; (2) the high-speed hydraulic type by which the product is conveyed by hot water through numerous lengths of pipe by a circulating pump and the aid of steam jets; and (3) the new "in-the-can" type wherein the product, after washing, is immediately put into cans after which hot water is applied. The whole is heated, and finally the blanch water is drained off.

### The Immersion or Conveyor Blancher

The first type is the round shell or enclosed screw-cage blancher which is in common use. It varies in length from 8 feet to 20 feet, and is usually half filled with water, heated by direct steam injection, the steam distribution pipe being located in the bottom of the shell directly under the rotating cage or screw.

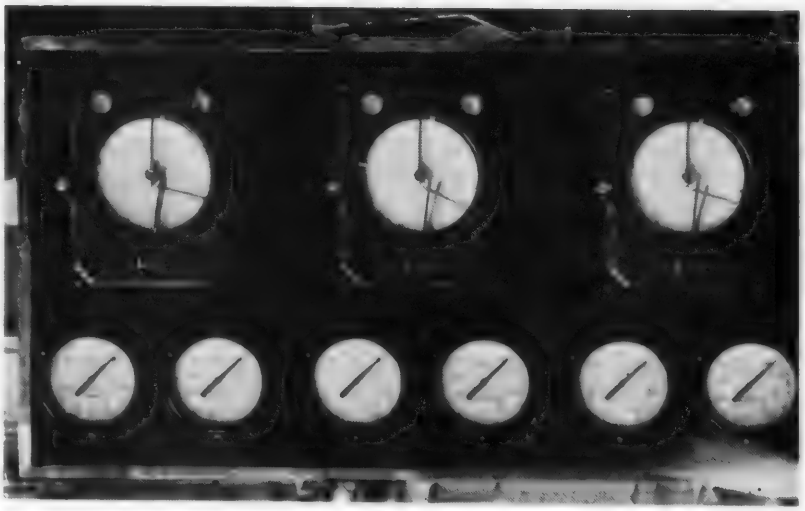
The product is fed into one end, immersed in water to the desired temperature, and carried through to the outlet end in a predetermined time by the screw conveyor. There it is discharged on to either a vibrating or a stationary screen. To maintain this type of blancher at the correct temperature throughout its entire length without automatic temperature controllers, is almost an impossibility. With the introduction of the cold product under varying load conditions, the inlet end of the blancher will fluctuate considerably in temperature. If an attempt is made uniformly to control inlet temperatures only, the outlet end will be almost invariably above the desired temperature, having a detrimental effect on the product.

To assure uniform temperatures through the entire blancher under any load conditions, the most satisfactory method is to control the temperature automatically at both the inlet and outlet ends. This is done by the use of two individual distribution pipes: the one supplying heat to the inlet end projects into the blancher for one-third of its length from that end, the other being about one-half the length of the blancher receiving its steam supply from that end. Each has its own temperature controller. With such an automatic controller arrangement, steam is fed to the section of the blancher needing it the most.



**Installation of fifteen recording temperature controllers maintaining constant processing retort temperature by the regulation of compressed air diaphragm valves fitted in the individual steam lines.** *Photos courtesy Short and Mason, Ltd.*

As the product enters the blancher, the inlet end cools faster than the middle (equalising) or outlet sections, with the result that the inlet controller immediately responds to admit the quantity of heat necessary and in proportion to the rate at which the raw product is fed. By the time it reaches the middle section it is thoroughly heated so that the controller at the outlet end admits just enough heat or proper temperature balance. Thus with this system of control both ends of the blancher are at all times maintained at the proper blanching temperatures, also eliminating the chilling effect at the inlet end when only one control is used in the outlet end.



**Double-sided panel of recording temperature controllers designed for central mounting between two retort pits.**

Certain types of the leaf or spinach blanchers are divided into two sections where the product is actually removed from the first section and is re-immersed in the second section. If the two sections are short, it is satisfactory to use one controller in each to obtain the best results. In either case, it is almost impossible to operate these blanchers without automatic temperature control because of the impracticability of maintaining uniform temperature results with the variable rate of feeding, to say nothing of the fluctuating steam supply pressure usually encountered.

### High-Speed Hydraulic Blanchers

The new high-speed hydraulic blanchers operate at slightly higher temperatures and shorter holding periods. This means that to obtain consistent results the temperature must be precisely controlled. With these machines the product is introduced into the hot water which is circulating rapidly through a series of pipes to obtain the desired blanch. The introduction of the product into the preheated water causes the temperature to fall rapidly, making it necessary to add heat to restore it to the proper blanching temperature. Because of the extremely short time-lag conditions, it is necessary to use a form of temperature controller which will respond instantly to the initial temperature changes and maintain the desired temperature under the extremely variable load conditions. This is accomplished by the use of a ratio controller which anticipates rapid changes and readjusts a final control element which enables the steam valve to maintain precisely the necessary final outlet temperature. Because of the many advantages that this type of blancher offers and because every advantage can be fulfilled with the type of control outlined, the canner will be assured that his product will be of the highest quality in so far as proper blanching is concerned.

### "In-the-Can" Blanching

A third and comparatively new technique, known as "in-the-can" blanching, is being introduced on a commercial basis for the first time. Many claims are being made for this system of blanching, and it is believed by its originators that when its advantages are better understood and recognised by the industry, it will become widely used. The washed product is introduced into sterile cans which are filled with hot water and heated thoroughly for a short time. At the end of the heating period, the cans are inverted, the blanch water is drained off, and in some cases a quick scalding hot rinse applied to remove foam. At the end of the tipping period the cans are brined, capped, and processed. Because the high temperatures and the short blanching time play an extremely important part in the success of this form of blanching, the canner must be assured that the initial can-filling water, the hot water or steam baths, and the final hot brine be maintained precisely at the recommended temperatures. If this is not done the main purpose of this system is lost.

### Exhausting

Where exhausting is carried out by heating the contents of the cans to a certain temperature as differentiated from a mechanically produced vacuum, temperature control is desirable. This will not only control the degree of vacuum in the finished pack, but will also avoid exceeding the

necessary temperature of exhausting and thus eliminate the use of excessive steam.

**Sterilisation**

The operation which is the most important to control is the sterilisation of cans. It is necessary to maintain within very narrow limits the proper processing temperatures, pressures, and times of the cook.

The sterilisation of canned fruits and some vegetables at or near 212° F. is carried out in open cookers of batch or continuous types. The batch type may be an ordinary vertical, round, or rectangular tank or retort. For the sterilising operation, the cans are covered with water and steam is introduced at the bottom of the tank through perforated or closed pipes, depending on the condition of the water and whether the condensate is to be returned to the boilers.

When processing in an open cooker the tendency of the operator is to let the water boil continuously to ensure complete sterilisation. Under these conditions a slight decrease in barometric pressure will liberate considerable uncondensed steam, which is a great waste. To avoid this loss of steam by cooking slightly under the boiling point results in erratic processing temperatures if control is manual. Automatic temperature controllers make it possible to process at temperatures slightly under the boiling point and realise fullest economy in steam and complete sterilisation. Also, unless all the water is at the required temperature, the product is not being thoroughly sterilised, and spoilage results. This is a tangible loss, but usually does not reveal itself until some later date.

**Open and Closed Cookers**

The continuous type of open cooker is usually a long, horizontal, round, or rectangular shaped tank in which a conveyor carries the cans through the boiling water. There are two types of these. In the first type, cans are rotated or slowly agitated as they pass through the cooker. In the second type, the cans are not agitated. In either case the cooker is usually filled with water, which, like the batch type, is heated either by perforated or closed steam pipes. One type of agitating cooker operates with a small quantity of water, with the heating coils placed in the water and above and surrounding the conveyor. For this type, one controller has been found satisfactory. With the non-agitating type, the conditions are somewhat different and are similar to those of the usual type of blancher, and would require two controllers, one at the inlet end (where it is subject to the greatest load fluctuations) and one at the outlet end. Automatic temperature control is again an essential feature in order to ensure complete sterilisation and economy of heat.

For processing products above 212° F., the closed pressure cooker is used. These cookers may be divided into two types. The batch type may be either vertical or horizontal. The cooker is loaded, the cover (or door) sealed, brought up to the cooking temperature, and held at this temperature for the requisite time period. The cans are cooled directly in the retort or removed and cooled in cooling canals or spray ponds, depending upon the size of package and type of container. Steam is introduced through perforated distribution pipes placed at the bottom of the retort. Over these distribution pipes is a perforated plate upon which are placed the two or three metal baskets containing the cans of goods to be sterilised.

When used with the dry steam process these retorts are said to have large heat capacity and small time lag. That is, there are considerable heat units absorbed by the product, but the time required for a temperature change to take place at the control bulb when a change is made at the control valve, is very short. An operator cannot manually control the temperature of a retort operating under these conditions unless he pays the strictest attention to one or two retorts only. Fluctuations in boiler pressure and the changes in the air currents surrounding the retort are reflected by changes in the internal retort temperature. Because retorting time has been cut to a minimum, exact processing temperatures must be maintained, otherwise quality is impaired. Automatic temperature control systems remove from the operators the responsibility for the maintenance of correct retort temperatures, and do so more accurately than can be accomplished by hand-controlled methods.

The automatic recording controllers operated by compressed air is the type of controller best suited for the operational conditions. These not only control the temperature but produce a written record of the exact temperature and the length of time the product is processed or sterilised. These records are the canners' only assurance that each batch of the product has been accurately and consistently processed. Also, should damage occur at a later date, reference to the graphic records will dispel any question as to whether or not the product was properly processed and save considerable time and expense in placing the responsibility where it belongs.

As there are many types of products which require processing and cooling to a definite time schedule, a "programme" type of time-temperature-pressure controller, with its associated valves, is a necessary feature.

**Continuous Fressure Cookers**

The importance of temperature control for the continuous pressure cooker is equally, if not more, necessary than their use on batch-type cookers. Operating characteristics of these cookers in regard to load change conditions are quite similar to the open-type continuous cooker. However, as these cookers are operated under pressure with live steam in contact with the cans, the large heat capacity

and short time-lag conditions exist. The controller should be of the air-operated, high sensitivity, recording type. One diaphragm valve in the steam inlet line to the cooker is necessary. A temperature controller is also necessary for the cooling section, which will automatically compensate for load changes and maintain cooler conditions at the most economical point which will ensure that the product is being properly cooled.

**Sterilisation in Glass Containers**

The processing of food in glass containers is usually carried out in either vertical or horizontal retorts, and as the containers cannot be subjected to great temperature differences without the hazard of cracking, the process of cooking and cooling is carried out in water to a definite time-temperature-pressure schedule. This ensures that the product is properly sterilised and that the caps will be perfectly sealed throughout the processing and cooling cycles. The importance, therefore, of a correct scheme of automatic control for this process cannot be underestimated.

There are no temperature and pressure processes used in the food-preserving plant where the expenditure for automatic control will not be realised in the improvement of the product quality, to say nothing of the reduction or elimination of certain tangible and intangible losses.

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## Secrets of a Famous Restaurant

ANOTHER sprightly book* by Mr. Iles Brody, author of *On the Tip of My Tongue*, purports, among other things, to divulge the kitchen secrets of "The Colony" of New York, described by the author as "the swankiest restaurant in the world." The first ten chapters are devoted to the goings-on in the establishment itself, and a sort of super-cookery book forms the last 79 pages.

It may be questioned whether, in this epoch of White Papers and bankruptcy, the reading of a book on gastronomy does not savour of mental deficiency. Not so very long ago tit-bits like Pheasant Souvaroff, "imprisoned in a casserole in the company of goose liver, truffles, and old Madeira, and cooked for hours," or better still, "a Brizola steak, a paper-thin affair cut off the rib and broiled in butter" were at least not matters for the delectation of posterity. However, Mr. Brody peppers his food with a wealth of amusing anecdotes.

The Colony is described in all its details—its lobby with its doorman afflicted with stomach ulcers who has to subsist on milk, a truly modern Tantalus; its decorations (even those of its lavatories, although the author half apologises for not being circumspect even in a book "aimed at sophisticates," which probably makes the more unsophisticated reader ready to forgive him a multitude of sins); its waiters, its chefs, and its clients.

In common with good citizens of a republic the author likes to write about royalty. Princes and princesses, millionaires, bankers, writers, and diplomats of all nations rub shoulders in his pages. The Duke of Windsor sealed the fame of the restaurant bar when he said to one of the owners: "We'll dine here, Gene, the bar has such a gay atmosphere." After that it was chic to dine in the bar instead of the dining-room.

The dining-room teems with plutocrats, pleasant and otherwise, and if the reader's taste lies in stories of their antics and the fantastic atmosphere surrounding them he has plenty to choose from.

Then there are anecdotes of the Colony kitchen. Mr. Brody discounts home cooking. He asks, "Who in the name of Mohammed can afford (and find) twenty-nine experts in the home kitchen?" His reply excepts some aged Croesus more attracted by longevity than good food, which underlines the eternal cussedness of things.

Some of Mr. Brody's advice is not in keeping with his aim at his sophisticates. For instance, his hints on dinner ordering and taking your best girl to dinner. The first rule is to abandon yourself financially and force yourself to appear a wastrel. You must groom yourself scrupulously, and in order better to focus all your attention on your guest and be brilliant in conversation you should wear a dinner jacket, or if you want the lady to downright lose her mind over you, you put on tails. You must not use the victory sign for indicating to the waiter that you want a table for two: and so on for about three pages. All of which seems to indicate that Mr. Brody sometimes has his tongue in his cheek, although it may induce the Verdant Greens among his readers to refurbish the pre-war "smoker."

And so we come to the Colony recipes. Here Mr. Brody hedges and tells us that "in all honesty by simply acquiring this book you will not make a precise replica of the Colony cuisine out of your own kitchen . . . you will need a regiment of chefs." However, he gives some useful little tips in some of his recipes; his mention of a "regiment of chefs" being part of his apotheosis of the Colony.

So much for how they eat in New York, and we turn to a little book† on dining in London. Written by a caterer and wine merchant himself, the author describes a number of eating places from the Savoy to pubs. He wends his way round the snack bars, butteries, Leicester Square, the byways, places where they dine and dance, and the foreign restaurants. The special dishes to be looked for are named, and, for the different classes of pockets, valuable information on house charges, which range from 4s. to 11s. 6d. Some useful notes on wines are included, although supplies of these have altered since the book was written.—T. C-W.

* *The Colony*. By Iles Brody. London. Pp. 192. Price 9s. 6d. net.

† *Dining Round London*. By T. A. Layton. London. Pp. 63. Price 2s. 6d.

# Acetic Acid Preserves

## Part I

J. R. BURRELL

The first of a series of articles on the principles of manufacture of pickles, sauces, and allied products, and the microbiological problems involved.

A FERMENTATION process which modifies the texture of vegetables, withdraws some of the water, and results in the formation of lactic and other organic acids and gas from the sugars present is normally considered a necessary preliminary to pickling vegetables in vinegar, while correct acidity at the later stage prevents further activity by micro-organisms which might otherwise result in spoilage of one kind or another.

Generally speaking it has been found that pathogenic micro-organisms will not develop in a strongly acid medium such as vinegar, so that in acid preserving there is no danger of bacterial food poisoning provided the various food materials have not been allowed to become contaminated through lack of hygienic precautions prior to pickling.

This being so, it becomes obvious that, from its microbiological aspect, the business of acid preserving resolves itself into two main factors: (*a*) achieving correct conditions for the lactic fermentation in the preliminary stage; (*b*) arranging correct acid strength in the finished article to inhibit further bacterial changes.

### Microbiology of the Brining Process

It has been found that there is a definite sequence as regards stages of development of micro-organisms, and as a result of investigation by Fabian, Bryan, and Etchells (*Mich. Agricultural Experimental Station, Technical Bulletin*, November, 1932), and others, it appears that in the first stages of the fermentation peptonising bacteria play a significant part, to be replaced later by the lactic acid producers. The micro-organisms responsible include such lactobacilli as *L. cucumeris* (probably identical with *L. plantarum* and *L. pentosus*) and *L. pentoaceticus*.

Leuconostoc mesenteroides gas-producing coccoid forms predominate in the initial stage. These produce acetic acid, acetaldehyde, ethyl alcohol, and carbon dioxide, as well as lactic acid, which is the major constituent of the fermentation end products. These cocci are practically non-putrefactive, and die off before the acidity of the whole rises beyond 1 per cent. They are replaced by the lactic rod forms—*L. cucumeris* (*plantarum* or *pentosus*), *L. brassica*, and *L. pentoaceticus*; betabacteria and torula may also be present, imparting a somewhat scented bouquet to cucumbers.

The several stages have been followed closely in the sauerkraut fermentation. The salt content of the shredded cabbage and salt mixture in this case, however, is only in the region of 2½ per cent. and the finished acidity 1½ per cent. Fermentation takes place in the range 60° F. to 70° F., and it is generally considered unwise to go outside these temperature limits, although there has been a suggestion that 86° F. is the optimum.

The reduced salt concentration of this product results in a rather different bacterial flora from that present in the brined vegetables already mentioned, but the conditions vary throughout the mass in both cases, and while salt is being absorbed in the early stages of both it is possible to have conditions duplicated, so that here and there, in the two different materials, can be found similar bacteria.

In order to provide correct conditions for rapid increase of the modifying bacteria it is necessary that optimum conditions should prevail for the growth of the lactic micro-organisms while ensuring that those capable of causing spoilage are not encouraged.

### The Lactobacilli

Lactobacilli are the main types of bacteria responsible for the lactic fermentation. For although leuconostoc (betacocci), debaromyces, and pichia, and many other types of micro-organisms are present during the brining action, the process could not take place without the lactobacilli. For convenience these bacteria have been placed in two main categories, *i.e.* the homofermentative and the heterofermentative types.

The first produce lactic acid only as their end product, whereas the others result in the formation of other organic volatile and non-volatile acids, and gas, as well as lactic acid, is formed. The gas is mainly carbon dioxide often accompanied by a proportion of hydrogen.

At the start of the fermentation, when the conditions obtaining in the fermentation vessels result in weak brine formation, there is usually a mixed flora of leuconostoc (betacocci) and small gram-negative rods, in appearance similar to *Escherichia coli*.

Later on the heterofermentative types of lactobacilli predominate, but although some of these are very acid resistant and persist to the end of the fermentation they become overgrown with homofermentative types and practically cease to produce

their various products during the final stage. Thus there is little gas produced in the latter part of the process.

The betacocci are able to grow and produce their quota of lactic acid only at the start of the fermentation or in parts of the mass where the salt penetration is slow, while the yeast bodies seen under the microscope from slides taken during the brining appear mainly to be false saccharomyces which need abundant air for their development, do not ferment sugars, and are almost certainly unnecessary and even inimical to the fermentation, as they make use of the organic acids formed for their continued development and multiplication. Thus they break down the lactic acid present to carbon dioxide and water. Owing to different temperature conditions, it is probable that the bacterial flora of British brined vegetables is more varied than that obtaining in the U.S.A. for species of thermobacteria, betabacteria, and also mesophilic spore formers are found in some British pickling vats.

### Conditions for Correct Fermentation

Conditions for correct fermentation include:

1. Clean vegetables—not softened or overripe.
2. Clean barrels or vats.
3. Temperature conditions between 60° F. and 70° F.
4. Initial salt content of brine, 10 per cent. rising gradually to 16 per cent. in six to eight weeks according to temperature conditions.
5. Floating head of wood kept in place with cross-pieces.
6. Uniform additions of salt every two or three days (emptied on to top board and washed in to rest of pickle with brine withdrawn from the bottom of vats).

The exclusion of air is necessary in order to (*a*) provide best condition for growth of the lactobacilli, and (*b*) retard the growth of the pseudo-yeast or mycoderma, which would otherwise develop at the expense of the lactic acid.

### Softening of Vegetables during Pickling

Presence of air and weak brine appear to be the prime factors in the softening of vegetables during pickling, and *B. vulgatus* and *B. mesentericus fuscus* have been shown to be involved in causing softening, but there is still a great deal of work to be done as regards classifying the causative organisms for we have found a great variety of types to be involved at different times. *B. vulgatus* appears to develop only in comparatively weak brines, below 8 per cent., so that this, at any rate, can be checked by attention being paid to this fact. *B. mesentericus* also does not develop or cause spoilage in the presence of strong brines, and in fact in most cases of softening, weak brines have been demonstrated.

### Quick Fermentation Process

In the flavoured lactic pickles which have a comparatively short life and are eaten straight from the barrel, the danger of softening is very great, for the vegetables are put straight into a weak brine (8 per cent.) in barrels which are then headed. These are best prepared in the summer where the temperature conditions allow of rapid growth of the lactic bacteria. The fermentation is complete in about a fortnight, and the pickle is ready for immediate sale or packing in acetic vinegar in jars.

This type of pickle will not last indefinitely, however, and cannot be kept in stock for any length of time, as softening will result unless the brine of fermentation is strengthened or replaced by a 16 per cent. to 20 per cent. salt solution, which must have a lactic acidity of at least 0·5 per cent. If for some reason it is convenient to use this process, it is advisable to have incubation chambers kept at the temperature of 68° F. to 72° F. for the short fermentation period. The time of acting may be cut down to eight to ten days in this case, and the brine should be reinforced after this period. After this reinforcement the product will only be suitable for bottling in vinegar.

### Addition of Sugar

In order to ensure rapid development of the lactic bacteria it is considered necessary, by some pickle firms, to add sugar to the brine. Only a minority of manufacturers use this method, however, although many use old pickle containing innumerable bacilli as starters when filling the vats or barrels.

The lactobacilli use the natural sugars of the vegetables for growth and production of lactic acid, and the amount of sugar varies greatly with the type of vegetable. Thus, onions are quite high in sugar, and cucumbers low.

However, it must be remembered that other changes take place apart from lactic acid production, and although the sugars in solution might be all converted into acid very rapidly, in cases where sugar is added and the lactic starter used, it does not necessarily follow that the typical modification of structure of the vegetable would be completed by this time, although it is true to state that the manufacturers who prefer to add sugar, on the advice of their scientists, claim to produce an excellent article of commerce.

Of late it has become noticeable that some pickling firms are putting their trimmed vegetables straight into a 20 per cent. brine (80 per cent. of saturation). It is easy to see that this is a very bad procedure, as the salt content is so high that it virtually prevents the lactic fermentation. True the material keeps, but it is "raw" and unsuitable for bottling in vinegar.

### Bacterial Spoilage after Bottling

In order to prevent microbial spoilage after bottling in vinegar it is necessary to (*a*) have a tight (hermetic) closure, (*b*) keep as small a headspace as possible in the bottle, and (*c*) have a minimum overall acetic acid content of 3·6 per cent. The necessity for these precautions is due to the fact

that there are several species of micro-organisms that will develop in vinegar provided there is abundant air present. Some of these live at the expense of the acetic acid, while others employ the traces of other organic acids that are present for their metabolism.

Apart from these there are several types of lactobacilli that actually ferment the remaining traces of sugars dissolved out of the brined vegetables. These, however, only develop as a rule when the acid content is below the 3·6 per cent. figure.

**Main Keeping Factor**

Although at first sight there does not seem to be a great deal in common between the various products preserved in vinegar, in actual fact their keeping properties depend on one essential factor, *i.e.* that the acidity (calculated as though it were present in the water content only) should be 3·6 per cent. minimum. If the acetic acid present in the water drops to below this figure, heterofermentative lactobacilli—which are usually present wherever there are pickles—may develop to produce active fermentation.

As the water content of the Worcester type sauces is very high indeed the acidity must be kept at the 3·6 per cent. (as acetic) level, but in cases where there are considerable soluble solids present the overall acidity may be greatly reduced. For instance, in a chutney with 50 per cent. water content and 50 per cent. sugar, acetic, gum, cellulose fibre, etc., the overall acidity may be practically halved.

**Moisture Content**

The important thing to know when ascertaining correct acidity to ensure keeping is the moisture content.

The same thing applies with regard to salad creams and mayonnaise, for although the soluble solids are not particularly high in these products there is a large amount of oil present. Thus, if one regards the emulsion formed of the watery constituents (with thickening and emulsifying elements, egg and flavouring), with the oil fraction, in the light of two separate phases, it is fairly clear that if the first were given an acetic content sufficient to ensure keeping, an addition of oil would probably make no difference to its keeping properties, for the matrix phase would still have its 3·6 per cent. acidity, although the mass would be filled and expanded by innumerable small oil globules. Therefore, although one may start off with a watery product of 3·6 per cent. acidity, the greater the admixture with oil the smaller will be the finished overall acidity and the more bland the finished emulsion.

**Spoilage Investigation**

The "acidity-on-water-content-factor" was arrived at after the author's investigation into the fermentation of such diverse products as Worcester sauce, sweet pickles, sweet thick sauce, tomato ketchup, and salad cream.

The spoilage was spread over a number of years, but the accumulated data consisting of moisture content, overall acidity, and solids content eventually made clear what had, in the past, been most puzzling, *i.e.* why products of diverse overall acidity should possess similar spoilage flora.

Routine cultures on wort agar and broth (3 oz. malt extract per litre of water) confirmed the statistical data as did series of tests carried out with acidified sugar syrups (containing some yeast extract) and also oil and weak syrup emulsions both seeded with spoilage organisms.

However, once the 3·6 per cent. figure was established it made the problem of the prevention of spoilage in acetic acid preserves—a most diverse field—a comparatively simple one for, providing the manufacturer carries out his processes under hygienic conditions that preclude the possibility of an evolutionary bacterial building-up of resistance to acid, he will find no trouble arising from fermentation in his preserves.

**Source of Spoilage Organisms**

The main vegetables used in pickles are onions, cucumbers, and cauliflowers. Before these are fit to be used for pickling in acetic acid vinegar they undergo a lactic acid fermentation in large vats, or in this country sometimes, casks.

In practice this means that the vegetables are placed in brine of such a strength and under such conditions as will allow the lactic-producing bacteria to develop while preventing the development of proteolytic types that would otherwise produce dark, mushy, malodorous, or otherwise spoiled pickles.

Contamination of the air by lactic bacteria, yeasts, and moulds is at maximum in pickle manufacturing departments, and it is therefore a wise plan to put into operation the maximum possible measures to keep down this flora by means of Chloros and regular painting and whitewashing. The great majority of lactobacilli types will not multiply in the presence of 2 per cent. acetic acid, but others occasionally evolve an unusually great resistance to acid, and, as has been pointed out, some heterofermentative varieties are among these.

*(To be continued)*

**TO AUTHORS**

FOOD MANUFACTURE is prepared to consider the publication of any books on scientific and technical subjects which authors might care to submit.

# The Fishery Industries of North America

## PART I.—FRESH AND FROZEN FISH

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The first part of a series of articles based on extended visits paid in the autumn of 1945 to the fisheries of U.S.A. and Canada, on both the Atlantic and Pacific coasts. In spite of the extent of these tours, it was not possible to include all major areas or to study all aspects of fisheries operations in each of the areas visited. In consequence, no claim can be made that the present account is exhaustive. In addition, changes may have been introduced in some instances since the date of the visits. Nevertheless, it is believed that these articles will still fairly describe the industry of today. Areas visited included New England and the Canadian maritimes on the Atlantic, and most of the Pacific coast from southern California to Vancouver, B.C.

THE trade in fresh and frozen fish is predominantly from the fisheries of the Atlantic coast, while the great fisheries of the Pacific coast find their major outlet in canning and in reduction to oil and meal. In all areas a certain amount of fish is distributed as gutted whole fish, packed in ice, or frozen as gutted whole fish, but by far the largest proportion is distributed as fillets, either iced or frozen. Since filleting procedure is often different from that commonly employed in this country, it seems desirable to describe it in some detail.

### Filleting of Fish

As with most industries, there is in fishery technology in U.S.A. and Canada a distinct tendency to greater mechanisation than in the United Kingdom. In the case of fish filleting, even though performed by hand in most cases, this tendency finds expression in the widespread use of conveyor belt lines in filleting houses, with rows of operators each of whom performs just one process, and then lets the partially treated fish pass on to the next stage, *e.g.* if fillets are to be skinned, this will be done as a separate operation by another group of workers. The use of conveyor lines also means that the filleters can devote all their time to the actual job of filleting. Fillets and offal are also removed continuously by means of conveyors. In the Gaspé Peninsula of Quebec, filleting of cod was unknown before the war, and there simple hand filleting on tables, rather like the usual practice in this country, was introduced during the war to supply frozen cod fillets to the United Kingdom.

### Scaling before Filleting

In New England, cod, haddock, and redfish are invariably scaled before filleting, but this is not true for cod and haddock in the Canadian mari-

**The combined efforts of some 3,500 cod fishermen from villages around the Gaspé Peninsula produce an annual catch of approximately 35 million pounds of cod fish. A big cod is hooked near Gascons.**

*Photos courtesy The Canadian National Film Board.*

times. Scaling in New England may be either by what are known as "hand" scalers, or by fully automatic machines. Even the hand scalers are electrically operated. They consist of a metal cylinder of about 1 in. diameter and 4 in. long, studded with specially shaped protuberances. The cylinder is rotated at high speed by a flexible drive, and brushed by the operator against the fish from head to tail, using a series of sweeping strokes. Scaling is very effective and complete.

The automatic scaler is employed on larger scale operations, and consists of a rotating, inclined cylinder of metal mesh or gauze, fitted inside with powerful water sprays. The fish tumble through it under gravity, and the scales are rubbed and washed off and pass through the casing. One machine of this type has been fully described in *Food Industries*, January, 1944, p. 68. As observed on these visits, scaling was not always quite complete, but was so nearly so as to be satisfactory. At only one firm was an adverse comment heard on this type of scaler, and that was that it tended to bruise heavy fish. Naturally, for fish that have been scaled, the skin is left on the fillet. In the Canadian maritimes, skin was removed from the fillets' destined for U.S.A. markets, but left on for fillets intended for the United Kingdom.

### Use of Water Flumes

Two departures from the normal use of conveyor belt lines were seen in some Canadian plants. One involved the use of water flumes to transport fish, fillets, and offal. The workers stood on platforms clear of the floor, permitting ready and frequent hosing down. It was noted, however, that with certain species, *e.g.* flat fish, there was a tendency for a few fish to become buried under others in the flume troughs, and such buried fish seemed in danger of staying there all day. In the same way, it was noticed that some of the offal tended to collect and remain for a considerable time at certain sharp bends in the flume. These features, however, could no doubt readily be put right, and may well not have arisen with other species of fish. An expensive item at one plant was the high water consumption, since town water had to be used in view of the unsatisfactory quality of the sea water available. At another plant, sea water of suitable quality was available and was, therefore, used.

The other novel feature noted in one plant was the use of a turntable, instead of a conveyor belt, for the skinning operation after filleting. It was claimed that this prevented any fillets being missed if they came too quickly—they merely came round again until removed by a skinner. It was noted, incidentally, that in factories producing skinned fillets on conveyor lines, it was necessary to put the fillets into pans between the two stages, thereby breaking the chain of continuous operation.

"Flounders" (a general term used for many kinds of flat fish in North America) used to be filleted to give four fillets per fish, but, in New England at any rate, are now always cut to give two fillets per fish and so save time and increase output per filleter. The dark-skinned fillets are subsequently skinned, but the white-skinned fillets are left with the skin on.

### Automatic Filleting Machine

The most interesting item seen on the tour was the automatic filleting machine for cod and haddock, developed by the Atlantic Coast Fisheries Co., and now introduced into the United Kingdom. Since detailed accounts of this machine have now been published (*e.g.* in particular that in *Food Industries*, October, 1946, p. 86), it is unnecessary here to describe it in detail. Suffice it to say that, as seen on the tour, it was working perfectly. One interesting feature in this connexion is the use of bandsaws to remove the heads from fish before feeding them to the machine. The blades are usually renewed once a week. The fish are scaled in a continuous scaling machine, as already described, before heading and feeding to the filleting machine. It was claimed that with the machine,

**Packing smoked cod fillets on the assembly line at National Sea Products, Halifax.**

nine men could do work otherwise requiring twenty-two men.

In certain areas the fillets of some species require further treatment due to the prevalence of parasitic infestation. This is true for redfish in New England, and for inshore-caught cod (but not for offshore cod) in the Canadian maritimes. The parasite in the case of the redfish is a small crustacean (the copepod *Sypherion lumpi*), and on the average about 8 per cent. to 10 per cent. of all fish are infected, although in some individual catches as many as 30 per cent. may be infected. This parasite has not so far been found on any other species of fish. It consists of a head, which is buried in the flesh of the host, and a long neck protruding through the skin of the fish and terminating in a sack-like mass of tissue, and all fillets are "candled" by the operators over illuminated glass sheets, and both cysts and parasites removed with specially shaped scissors. In the case of the inshore cod, the parasite is a worm which inhabits the flesh. Infestation is heavy. All fillets are candled and any parasites are removed with tweezers.

**Icing of Fish**

On the Atlantic coast, but not on the Pacific coast, whether intended for distribution in ice, or for freezing, all fillets are usually given a short dip (a few seconds) in brine. Dipping may be automatic. The usual strength of brine is from 10° to 15° on the salinometer, and its purpose is partly to improve flavour, and partly as a preservative in the case of iced fish. For frozen fish, the purpose is partly to reduce drip on thawing. In some Canadian factories fillets are given a brief dip (one minute) in a 0·5 per cent. solution of sodium nitrite, giving a final concentration of nitrite in the fish of about 200 parts per million. Such practice, although widespread, does not meet with official approval. It is claimed that the nitrite, by reducing the bacterial load on the surface of the fillet, adds several days to its storage life in ice. Nitrite is not used in U.S.A.

Akin to this subject is that of preservative ices. Such ices, to be effective, must come into actual contact with the fish, and as will be seen below, this is not the case with iced fillets. For whole fish, packed in ice, nitrite-containing ice has been used experimentally in Canada, but is not in regular use. In parts of U.S.A., a preservative ice containing "Nobac" (formerly called "Nipicide") is used. This ice contains 0·05 per cent. of a mixture of equal parts of sodium benzoate and chloramine T, giving the equivalent of 20 parts per million of free chlorine in the ice. Opinions differ as to the degree of extra preservation achieved. "Nobac" ice is permitted by the U.S. Food and Drug Administration only for use with whole fish, which must be subsequently filleted and skinned.

For distribution in the iced form, fillets in U.S.A. are usually packed into tin boxes, either rectangular or circular, generally holding 20 lb. Usually the fillets, either individually or in pairs (*e.g.* mackerel) are wrapped in Cellophane or waxed paper before being placed in the tins. The tins are then packed three deep in a wooden box or barrel and surrounded with crushed ice. These tins are non-returnable. In Nova Scotia, fillets are commonly packed into 10 or 15 lb. wooden boxes, several of which are then placed crosswise and a few inches apart in a large wooden box, the spaces being filled with ice.

## THE FREEZING OF FISH

The methods employed in freezing fish depend not only on the species but also on the area and the choice of the particular factory.

**(a) Blast Freezing**

Predominantly employed in New England, blast freezing is also used to a lesser extent in other areas. It is typically used for fillets of cod, haddock, and flounder, which are packed for freezing

**Fishermen haul their nets from holes in the ice during winter fishing, Manitoba.**

into wooden boxes holding 15 or 30 lb. of fish, and which are lined before filling with a specially cut sheet of moisture-vapour-proof Cellophane or waxed paper. After filling, this sheet is folded down and overlaps to enclose the pack fairly completely. Cellophane is generally preferred to waxed paper, which is inclined to crack at the folds. The fillets themselves may be wrapped in Cellophane or paper, or the layers of fillets in the box may be separated by sheets of such material, although often no such internal packing is done. Fibreboard cartons have been tried instead of wooden boxes, but have always given trouble through collapsing when stacking for freezing, and during subsequent cold storage.

It is common practice to load the boxes of fillets on to trolleys or trucks, using narrow spacing boards to keep the boxes apart and to facilitate air circulation. These trucks are then pushed into the blast rooms, which are usually tunnel-like chambers into which the trucks fit fairly closely. A blast room can often accommodate 75,000 to 100,000 lb. of fish fillets, and a large plant will have a number of such chambers. Air circulation is usually transverse to the length of the tunnel, the long walls of which are fitted with louvres, the freezing coils and fans being outside the tunnel. The air temperature, with fans running, might drop as low as $-35°$ F. Freezing time is estimated at from twenty-four to thirty-six hours—at least it is customary to leave the boxes in the freezing chambers for that length of time, before transferring to the cold store.

A different type of blast-freezing operation can be seen in one plant on the Pacific coast of U.S.A. Here fillets are packed into flat aluminium pans or boxes with loosely fitting lids, holding 5 lb. each. The fillets are either individually wrapped, or else a solid block of fillets is packed into each pan. The filled pans are placed on trucks, into which they fit very snugly, forming layers of pans separated by wooden sticks. The trucks in turn fit closely into one or other of two small chambers in which an air blast at about $-20°$ F. and 700 linear feet per minute is circulated over the pans. The two freezing chambers, each of which can hold one truck, are built side by side, with the freezing coils built into a space between them. Only one freezing chamber is usually operated at a time.

When a solid block of fillets is prepared, the frozen block is glazed. The wrapped fillets are packed into cartons of the same dimensions as the freezing pans.

A novel operation involving freezing in moving air (even if not a true "blast"), also to be seen on the U.S. Pacific coast, is the production of frozen salmon steaks for the hotel and restaurant trade. The fish are dressed (headed and gutted) and frozen on metal mesh trays on trucks, which are pushed into the freezing room. This room has overhead freezing coils and an air diffuser at one end, this diffuser being of the self-defrosting type using calcium chloride solution. With a full load of fish, the room air temperature is about $-10°$ F., but with no load it falls to $-20°$ F.

After freezing, the salmon are trimmed on a bandsaw (the trimmings being sold to fox and mink farms), and are then cut into steaks on a second bandsaw. Small pieces are retained for subsequent smoking operations, while saleable steaks pass on a wire mesh conveyor through a continuous glazing device. This consists of a series of water sprays, both above and below the conveyor belt. The glazed steaks are packed in wooden boxes with a brown paper liner, with a sheet of parchment paper between each layer of steaks. The boxes are kept in cold storage until required.

**(b) Shelf Freezing**

In the shelf freezing method the fish, either individually if large or in boxes or metal pans, are frozen by placing them on shelves or racks which are formed by the refrigerating coils of the freezing room. There may or may not be a fan or diffuser providing air circulation.

In New England, pan freezing is widely used for whole mackerel. These are placed one layer deep in metal pans, which measure about 14 in. × 24 in., and which take two rows of fish, arranged with the heads outwards. Freezing time on shelves maintained at $-35°$ F. to $-40°$ F. by direct ammonia expansion, with an atmospheric temperature of about $-20°$ F., is about twenty-four hours. After freezing the pans are passed through a tank of warm water in one of the cold storage rooms to free the block from the pan and also to glaze it. The blocks are then stacked on the floor, without any boxing, and the stacks are reglazed by spraying with water when necessary—say once a month. For distribution the blocks are packed into wooden boxes.

It is also common with shelf freezing to pack the fillets into wooden boxes of the same type as those described under blast freezing. A variation was seen at one plant in California, where small fish such as mackerel are frozen in perforated cartons, placed on the shelves, after which the fish are glazed inside the cartons by dipping into water. At the same plant fillets are frozen in metal pans and subsequently packed into cartons.

The freezing plants in the Gaspé area of Quebec are all of the shelf type and, as already mentioned, the freezing of cod was a war-time development there. These freezing stations, at various points around the coast, were formerly bait (herring) freezers, set up by the Quebec government, and adapted for their war-time purpose. Their future use was uncertain at the time of the visit.

Large fish frozen individually in shelf freezing rooms require anything from twenty-four to forty-eight hours for complete freezing, after which they are glazed before storage. If too large to place on

the shelves, they are simply placed on the floor of the freezing chamber.

In Canada, but not in U.S.A., salmon fillets intended for freezing are commonly given a one-minute dip in a 0·5 per cent. solution of sodium nitrite, similar to the treatment given to iced salmon fillets, but for a different reason. With frozen salmon the purpose is to cause the fish to "retain" their pink colour on subsequent cooking. As already mentioned, this practice does not meet with official approval, but it is, nevertheless, tolerated.

Glazing water must, of course, be heated, *e.g.* by steam coils, to prevent it freezing with continued use, and because the glazing tanks are usually situated in a refrigerated room or a cold store. It is widely, but not universally, believed that warm water is preferable to cold, as it imparts a more even glaze. Others favour water just above the freezing point, on grounds of economy of operation. Sea water, or water containing three per cent. salt, has been found by many to give less trouble with cracking than a pure ice glaze.

**(c) Plate Freezing**

There is no need to describe such a well-known machine as the Birdseye plate freezer, which is widely used in all areas for freezing fish fillets, or to describe the similar Jackstone freezer, which, like the Birdseye equipment, has been introduced into Great Britain. A somewhat different design of plate freezer, of the firm's own design, is operating at one plant on the Pacific coast of U.S.A. In this method the fillets are packed into open top flat cartons, each holding 1 lb., and these cartons in turn are fitted snugly into spaces in a metal lattice framework. The whole of each frame thus forms a flat square sheet containing about thirty cartons of fillets. Five such frames are then placed between the freezing plates of a cabinet freezer, and the plates closed down on to the frames. Afterwards the cartons are wrapped in Cellophane, which is heat-sealed, and are then slipped into an outer sleeve carton.

## COLD STORAGE OF FISH

The most widely used temperature of storage of fish over the whole area is 0° F., but on the Canadian Pacific coast in particular there is a growing tendency to use much lower temperatures, *e.g.* −20° F. This is due to the greater difficulty of storage of fatty species, which predominate on the Pacific coast, due to the pronounced tendency of the oil to become rancid.

In practice the store temperatures fluctuate rather widely, *e.g.* from 5° F. to −10° F., although the bad effects of such fluctuations on crystal growth and drip are fully realised.

*(To be continued)*

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# Ministry of Food

## Latest Statutory Rules and Orders

The list given below is the continuation of the list of Orders published in *Food Manufacture*, March 1, 1948, page 117.

| *No.* | *Date.* 1947. | PRICE FIXATION ORDERS |
|---|---|---|
| 2841 | Dec. 31. | Order amending the Lard (Control and Maximum Prices) Order, 1943. Revokes S.R. & O. 1947, No. 558. |
| | 1948. | |
| 64 | Jan. 20. | The Dried Fruits (Control and Maximum Prices) Order, 1948. Revokes S.R. & O. 1943, No. 1303; 1945, No. 100; 1946, No. 2207; 1947, No. 987. |
| 78 | ,, 22. | Order amending the Fish (Control and Maximum Prices) Order, 1947. |
| 130 | ,, 28. | Order amending the Salmon (Maximum Prices and Distribution) Order, 1944. Revokes S.R. & O. 1946, No. 2199. |
| 150 | ,, 30. | Order amending the Eggs (Control and Prices) (Great Britain) Order, 1946. Revokes S.R. & O. 1947, No. 525. |
| 151 | ,, 30. | Order amending the Eggs (Control and Prices) (Northern Ireland) Order, 1947. |
| 152 | ,, 30. | Order amending the Imported Canned Fish (Maximum Prices) Order, 1947. Revokes S.R. & O. 1947, No. 2110. |
| | | FRUIT |
| 79 | Jan. 22. | The Home-Grown Apples Order, 1948. Revokes S.R. & O. 1946, No. 1208. |
| 147 | ,, 30. | Order amending the Imported Apples Order, 1946. |
| | | MANUFACTURED AND PRE-PACKED FOODS |
| 131 | Jan. 28. | Order amending the Manufactured and Pre-packed Foods (Control) Order, 1942. |
| | | MILK |
| 146 | Jan. 30. | The Milk (Priority Supplies) Order, 1948. Revokes S.R. & O. 1947, No. 2239. |
| | | POINTS RATIONING |
| 149 | Jan. 30. | Order amending the Food (Points Rationing) Order, 1947. |
| | | RATIONING |
| 4 | Jan. 5. | Order re-enacting the Bacon (Rationing) Order, 1947. Revokes S.R. & O. 1947, No. 2220. |
| 128 | ,, 28. | Order amending the Fats, Cheese, and Tea (Rationing) Order, 1947. Revokes S.R. & O. 1947, No. 2795. |

# The Diesel Engine in the Factory

H. C. APPLEBY, A.M.I.Mech.E., M.Inst.F.

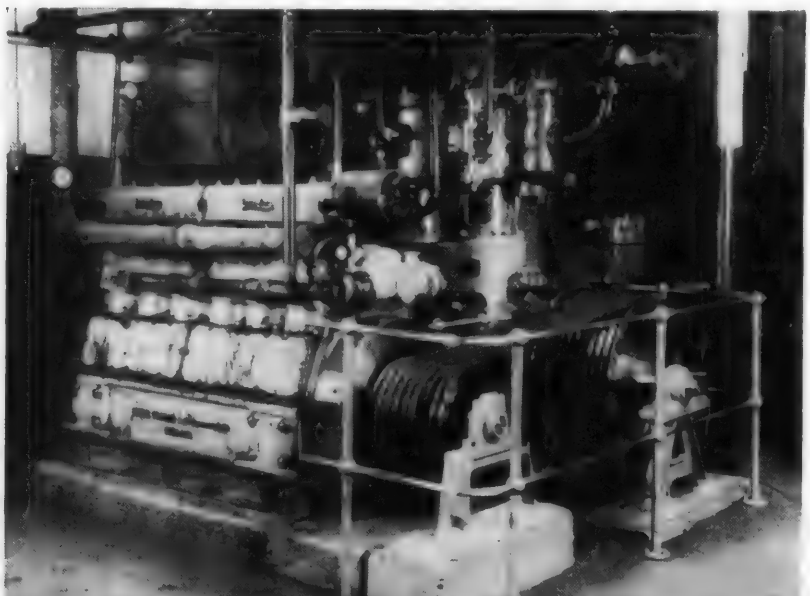
ALL industrialists who produce the motive power for driving their factory plant, and in many cases their electricity generators, by means of steam-driven plant, have had the unpleasant experience of finding their factory idle because of shortage of fuel when coal has been the only combustible available. The "shut-down" periods may have been of brief duration due to deliveries of coal containing a high percentage of non-combustible matter, or the works may have been stopped entirely because of its non-delivery. In either event, from whatever cause, production has been either partially or completely delayed, causing serious financial loss, to say nothing of tending to create chaos throughout the factory. The Government are apparently doing their best to obviate the trouble, but have only met with a little success so far as increased production of more and cleaner coal is concerned, and has this year (rightly in the opinion of many people) sponsored a programme introducing oil-driven plant in order to ease the coal position.

Not only in new factories should the introduction of oil-driven engines be considered, but their use as an auxiliary to existing plant, carrying *part* of the load at peak periods, is worthy of serious consideration. Again, in some factories the plant may be in such condition as to render necessary either complete replacement or to require heavy expenditure in repairs and renewals.

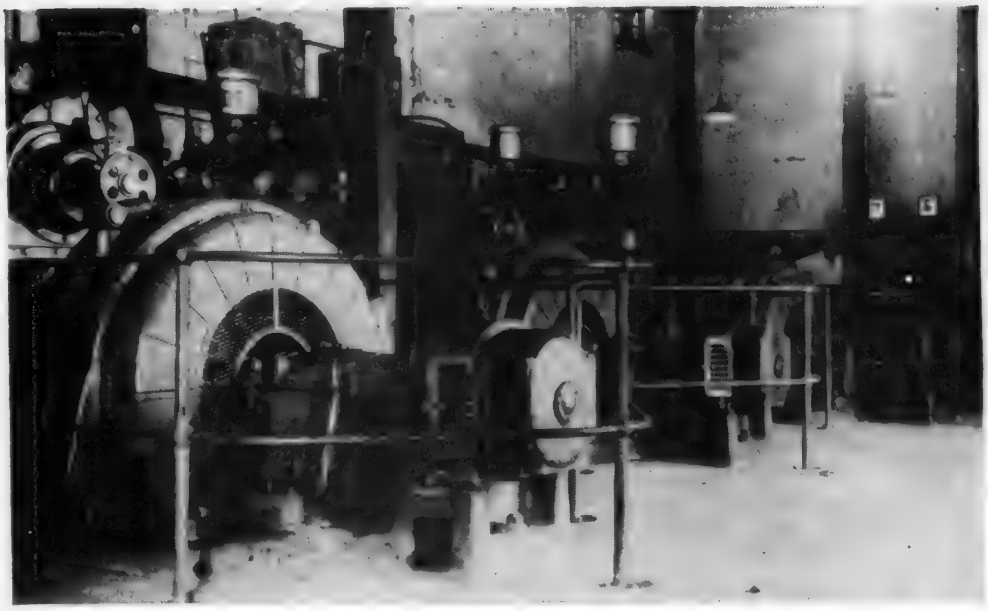
Where complete equipment for providing power drives and/or for providing means of driving electricity generating plant, with oil as the combustible at the engine itself (eliminating the use of boilers and their auxiliaries), is desired, the Diesel engine will meet all requirements. The Government is encouraging its use, and, while very early delivery of new plant cannot be expected, it must be remembered that coal shortage and high prices are likely to prevail for a long time, so that in cases such as those specified above, and in some others, the introduction of an oil-driven Diesel engine is at least worthy of consideration.

### Advantages of the Diesel Engine

The Diesel is not a new type of engine in the experimental stage; it was produced for commercial use in 1897, when it was proclaimed by numerous engineering and scientific committees from various countries who tested it that a higher heat efficiency was obtained by it than by any other known heat engine. Subsequent experience in practice, and the gradual improvement in manufacture, have resulted in still better results being obtained. The engine has been found to be very reliable, low in upkeep costs, and eminently suitable for standby duties to large steam turbine plant or power supply from public authorities. When fitted with automatic starting equipment it can rapidly restore essential services and greatly reduce the dislocation which normally follows the failure of any other power supply. It is produced for industrial outputs of from 150 b.h.p. to 3,500 b.h.p., and it is worthy of mention that in many factories appreciable savings are being effected in the cost of factory processing when



**A Paxman Mark 6RW 120-168 b.h.p. engine, 6 cylinder, coupled to Reavell compressor for supplying compressed air system.**



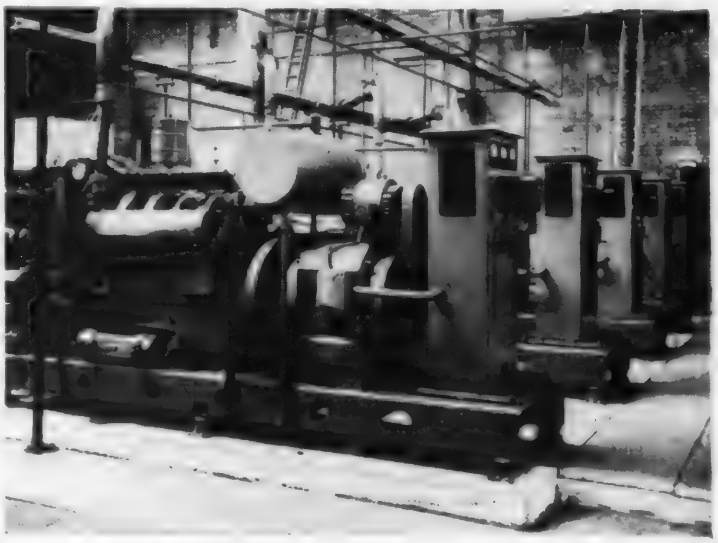
**Paxman Mark 4RPL engines, 4 cylinder, 224-243 b.h.p. coupled to electric power generators.**

both water jacket and exhaust heat are put to beneficial use.

As with other engines, it is imperative that details relating to the care of these engines must be always observed, and for the benefit of those who are actually in charge of engines of this type a few suggestions are put forward which can, if observed, help to avoid trouble.

It is essential, at all times, to use the cleanest fuel obtainable for use with the Diesel engine. Dirty oil containing many different forms of impurity is the chief potential source of trouble and every effort should be made to obtain oil that is free from water, abrasive or corrosive matter, or solids which may cause obstruction in the oil lines. Abrasive matter may cause much trouble at pump and injectors, and create very unstable performance of the engine by upsetting the balance of load between the cylinders. Water in the fuel is liable to cause the engine to "flutter" and, in a bad case, to stop the engine. Any solid matter in the oil that gets past the main oil pump may set up choking at the injector nozzle holes or become a fixture on the injector needle seat.

When first installing an engine it is a wise plan to ensure that all filters used on the job, such as those used for oil, air, or water, are of ample capacity for their duty; or, better still, to insist upon twin filters in every instance so that one filter can be ready for use if it is found necessary to inspect and clean the other while the engine is still running. This will incur a little extra cost, but that cost is money well spent.



**A group of 55 kW. Diesel generating sets installed at J. Lyons and Co., Ltd., Greenford factory.** *Courtesy Associated British Oil Engines, Ltd.*

If the fuel is of a very heavy nature, starting of the engine may prove to be difficult. The simplest way to overcome this is to provide heat to the tanks, pipes, pump, and atomiser, but it is advisable to use the lightest oil available that is suitable for the engine in use.

Troubles will ensue if the water-cooling system is not maintained absolutely tight to ensure that water flow through the jackets is maintained. If the water line has not been used, due to the engine being out of action, a careful overhaul of the line should be made before starting up to make sure that mechanical damage or fractures have not been caused while the engine has not been in use.

Under similar conditions, the lubrication system should be also tested for oil tightness, either by motoring the engine with the fuel turned off, or by using, if one is fitted, the hand-operated circuit priming pumps. The pressure should be raised to about 10 lb. per sq. in. and notice taken to see if this pressure is maintained, or whether it is inclined to drop quickly. If the latter should happen it is more than likely that oil is escaping from main or big end bearings, or that joints in pipe lines or at the filters are leaking.

In cases where the engine is fitted with an air cleaner (as is almost invariably done) great care should be taken to avoid this becoming partially choked. When the plant is installed in factories where the air contains a lot of dust, the makers' instructions should be carefully carried out with regard to cleaning of air filters, whether they be one-piece elements or of the multiple panel type.

**Maintenance of Records**

A log should be kept, booking every half-hour all information appertaining to the running of the plant, such as (where an electric generator is attached to the engine) the load in amps., the pressure of the current, gallons per minute output for pumps, engine-room temperature, water inlet and outlet temperatures, the exhaust temperature of the cylinders, and lubrication oil temperatures and pressures. At the end of each day the record should show the total time run, the units generated, gallons pumped or the quantity of whatever work is done, the maximum load during the day, and the time it was recorded. Fuel tank readings (*i.e.* the amount of fuel in the tank) should be recorded at both the start and finish of the working day, and a note made of the number of gallons of oil used during the run. All those figures should help to eliminate losses due to inefficient operation and to any leakages or wastages that may have developed.

A new competitor in the oil world is now being marketed. This differs from the Diesel in so much as the new engine is a gas turbine. The first sea-going vessel to be propelled at sea by a gas turbine was a British naval craft, in August, 1947. This engine was designed by a Manchester firm and was of an experimental type, carrying a maker's rating of 2,500 s.h.p.

The plant comprises a gas generator consisting of a compressor, a combustion chamber, and a turbine driving the compressor; this is followed by a power turbine, mechanically independent of the compressor turbine, and coupled by a reduction gear to the propeller shaft.

It would appear that this type of machine is of simple design, cheap and light, and further development in industrial practice will be awaited with interest.

# A Technical Dictionary

A DICTIONARY* containing about 50,000 definitions included in one volume has recently been published. The items cover every field of scientific and technical development, and the dictionary is written for both professionals and laymen. It contains a great many internationally accepted terms which facilitate mutual understanding between the scientist and technical worker of many countries.

The nomenclature in this dictionary is that generally adopted by the chemist and engineer. Thousands of helpful cross-references are included and arranged so that the desired terms can be located with a minimum of effort.

A special feature is an up-to-date compilation of thousands of trade names or proprietary products in the synthetic resin, plastics, metal, rubber, textile, food, pharmaceutical, paint, and varnish fields, including emulsifying and wetting agents, plasticisers, and detergents.

The newest trade names and definitions of additional technical terms are incorporated in the addenda. Thousands of abbreviations, contractions, and many useful tables add to the value of this book.

* *Concise Chemical and Technical Dictionary.* Edited by H. Bennett. U.S.A. Pp. 1055+xxxix. Price 45s. net.

## BOOKS RECEIVED

*Orders for any of the books listed below or reviewed in this issue may be placed with the Books Department,* FOOD MANUFACTURE, *17, Stratford Place, London, W.1. It is regretted that under present conditions it is not always possible to supply books by return of post.*

*The Biological Standardisation of the Vitamins.* By Katherine H. Coward, D.Sc. 2nd Edition. Pp. 224+vii. London. Price 16s. net.

*The Elements of Fuel Technology.* By Godfrey W. Himus, Ph.D., A.R.C.S., D.I.C., M.I.Chem.E., F.G.S., F.Inst.F. Pp. 506+xvi. Leonard Hill Limited. Price 42s. net.

*A Study of Individual Children's Diets.* By E. M. Widdowson, B.Sc., Ph.D. Pp. 196+vii. H.M.S.O. Price 6s. net.

# The Use of Scientific Instruments in Chemical Analysis

J. H. GLOVER, B.Sc., A.R.I.C.

## PART VI.—POLAROGRAPHY

One of the most important developments in analytical chemistry during recent years has been concerned with the use of polarography. Both in inorganic and organic analysis, polarographic methods have the advantages of speed, accuracy, and application to small samples.

THE polarograph is a form of electrolysis apparatus, the principle of the instrument being the measurement of the current passed through the solution under test, under the influence of a steadily increasing applied voltage. The relation between current and applied voltage is expressed on a graph, known as a polarogram; and the shape of the resulting curve is, under suitable conditions, indicative of the nature and concentration of the ions in the electrolysed solution.

It is well known that the electrolysis of a solution containing metal ions results in the deposition of the metal at the cathode. This deposition only occurs when the applied potential reaches a specific value; hence as the potential is increased from zero no current will flow through the solution. Current begins to pass only when the deposition potential is reached, and the current increases sharply at this point. It is upon the principle of deposition potentials that the theory of the polarograph is based.

### The Dropping-Mercury Electrodes

The polarograph employs mercury electrodes: the cathode consists of mercury dropping through a capillary, and the anode is a pool of mercury. This type of dropping electrode was employed in 1922 by Heyrovsky, who has been responsible for the majority of the developments in polarography. When electrodes of this type are employed for electrolysis of a solution the following conditions occur: until the deposition potential of the ion is reached the current is almost independent of applied voltage; at the deposition potential there is a sharp increase in current, this increase continues until the zone of solution surrounding the mercury drop is devoid of the ions which are being deposited; at this point the current is governed by the rate at which these ions can diffuse from the main bulk of the solution into the depleted zone.

This rate of diffusion is dependent upon several factors, including the concentration of the discharging ion in the bulk of the solution. When steady diffusion conditions are attained, the current again becomes almost independent of applied voltage.

Thus a graph of current against voltage would represent the following effects: first, an almost constant current, then, at the deposition potential, a sudden increase in current, and, finally, a steady current which is practically independent of the applied voltage. The deposition of an ion at the dropping-mercury electrode would be marked by a "step" in the current-voltage curve; the location of the step with respect to the applied voltage is characteristic of the ion involved. The voltage at which the step occurs is known as the half-wave potential. The height of the step is proportional to the diffusion current, which has already been shown to vary with the concentration of the ion. Hence it is theoretically possible to conduct simultaneous qualitative and quantitative analysis on the same solution.

The currents involved in polarography are usually very small, and the changes in the body of the solution are too minute to be measured. Each drop of mercury exposes a fresh surface to the solution with identical properties, and so determinations may be repeated many times on the same solution with great reproducibility.

### Supply of Mercury

In the polarograph the dropping-mercury electrode is supplied by means of a fine bore capillary tube connected to a reservoir containing mercury. The reservoir is raised to give a head of about 30 ins.; the head of mercury and the bore of the capillary may be adjusted to give a suitable dropping rate. This should be about one drop per three seconds in normal KCl solution. The mercury-pool electrode completes the electrolysis system. Connexions to the two mercury electrodes are made by platinum wire contacts. A sensitive galvanometer is connected in series with the electrolysis system; this is usually provided with a variable shunt to permit the use of different sensitivities.

The applied voltage for the system is supplied through a potentiometer wire connected to an accumulator, the required voltage being tapped off by means of a sliding contact. The wire is usually

wound round a circular drum which may be driven at constant speed by an electric motor, thus continuously increasing the applied potential. Variations in current may be recorded photographically by the use of a "spot" type galvanometer; the beam of light from this is received on sensitised paper revolving at a speed proportional to that of the potentiometer drum.

In this way polarograms may be automatically recorded, and polarographs operating on these lines are available. It is not essential to have an automatic instrument; manually operated polarographs can be quite satisfactory.

### Determination of "Constants"

The component most liable to give trouble in polarography is the capillary. The drop time must be standardised around three seconds: a longer drop time gives an oscillating effect on the galvanometer, and a shorter time gives rise to other irregularities. It is usual to determine the "constants" of a capillary; these constants serve to characterise the dropping electrode conditions in quantitative work, and also give an indication of the proper working of the capillary. Any change in the value of these constants shows up a defect such as dirt or moisture inside the capillary.

Two properties of the capillary are usually determined. They are:

1. The capillary constant K
2. The radius of the orifice R

K may be defined as the pressure in cm. of mercury necessary to cause a flow of 1 mg. mercury per second through the capillary. It is determined from measurements of the weights of mercury delivered per second under a series of mercury heads. R may be obtained from a measurement of the mercury pressure which just fails to cause flow through the capillary. This pressure is known as the critical pressure, and is a function of the size of the orifice and the surface tension of mercury.

### Purity of the Mercury

The success of a polarographic determination also depends to a great extent upon the degree of purity of the mercury used. Two simple criteria of purity have been described: Wickers[1] states that 0·1 to 0·2 parts per million of base metal impurities may be detected by a "tailing" test; and Muller[2] describes a test based on the stability of a mercury foam in distilled water. Many purification procedures have been described, the most usual method is the oxidation of impurities by a stream of air and their subsequent removal by pinholing and treatment with dilute nitric acid.

### Choice of the Base Solution

Polarographic measurements are always carried out in what is known as a "base solution." This consists of a solution of an ionised salt, generally a salt of an alkali metal whose deposition potential is higher than that of the substance under investigation. The choice of a suitable base solution for a particular determination is governed by many factors, for example the nature of the ions used in the base solution defines the working range of the determination. The ions affect the potential of the mercury anode and so cause an alteration in the value of deposition potentials, also the deposition potential of the metal ion of the base solution forms an upper limit to the possible range of the polarogram.

Broadly speaking the function of the base solution is to give a pure diffusion current; the current passed through a system containing the dropping-mercury electrode is not entirely based on the rate of diffusion into the depleted zone as already described; a "migration current" due to migration of charged particles also contributes to the total current passed. This latter current is suppressed by using a base solution of a concentration equal to about twenty-five times that of the substance to be analysed, thus ensuring that the current is directly proportional to the concentration of the electrolysed ion.

### The Adsorption Current

Beside the diffusion and migration currents, there is often another, abnormal, current which is encountered during the electrolysis. This abnormal current is the adsorption current, and is responsible for the appearance of maxima on the polarogram. The occurrence of a maximum or peak will alter the shape of the usual step; the current increases greatly beyond its normal value and then suddenly drops again to give the pure diffusion current.

Maxima are considered to be due to the adsorption of the metal ion, and may frequently be suppressed by adding a trace of a colloidal substance to the base solution. Efficient maxima suppressors include gelatine, starch, glue, and some dyestuffs.

### Applications of the Polarograph

Oxygen is capable of analysis by means of the polarograph, the amount usually encountered in solution in water is sufficient to give a large step covering a wide voltage range. Hence oxygen must be removed from any solution before an analysis is attempted; oxygen may be removed by bubbling hydrogen through the solution or by adding an easily oxidised compound, such as sodium sulphite, to the base solution.

Polarographic methods have been applied to the analysis of most metals in concentrations of the order of 10 parts to 100 parts per million methods for the determination of copper, zinc, lead, manganese, and other metals have been described. The average accuracy of a polarographic determination is of the order of ± 1 per cent. to 2 per cent., and many de-

terminations may be made on 2 ml. to 3 ml. of solution.

In the field of organic chemistry, polarography has found numerous applications, often supplying a simple method for what was hitherto a difficult and complex determination. The factors involved depend upon oxidation-reduction potentials, and many reducible compounds are capable of estimation. Vitamin C and vitamins of the B complex have been estimated by the polarograph; the scope of the method may be illustrated by the fact that such different substances as hormones and acetaldehyde have been estimated.

A modification of polarographic analysis is known as "amperometric-titration"; in this technique the solution is maintained at the half-wave potential of the substance to be determined. The titrant consists of a compound which will remove the ion under analysis from solution, either as a precipitate or a complex ion; thus the diffusion current is steadily reduced by the addition of titrant until a minimum current is obtained—this condition represents the end point of the titration. Amperometric titrations may also be performed the other way round; that is, at the half-wave potential of the titrant. The end point is marked by the appearance of a diffusion current due to excess of the titrant in solution. A summary of this technique has recently been presented by J. T. Stock.[3] The same reference describes some of the latest developments in polarography, including a description of the rotating platinum electrode, which is a possible alternative to the dropping-mercury electrode.

Differential polarographic analysis, which is a technique employed in determinations where two diffusion currents may overlap, consists of the simultaneous analysis of two solutions, identical except for one of the interfering ions, the difference in diffusion currents being recorded. This method, together with the application of the cathode ray oscillograph to polarography, has been described in a recent paper by Heyrovsky.[4]

REFERENCES


[1] Wickers, *Chem. Eng. News*, 1942, **20**, 1111.
[2] Muller, *Chem. Eng. News*, 1942, **20**, 1528.
[3] Stock, *Analyst*, 1947, **72**, 291.
[4] Heyrovsky, *Analyst*, 1947, **72**, 229.


## Work at East Malling

THE annual report of the East Malling Research Station, covering the period from January 1 to December 31, 1946, has recently been published.

The progress that has been made in the reorganisation of research programmes is reflected in Section II, wherein will be found accounts of new lines of work that have been started since the end of the war and are now being actively pursued. Some of these show a return to investigations of the more fundamental problems of the growth, cropping, or health of fruit plants, while others are of more immediate practical concern to the fruit grower. There are fewer bulletins for fruit growers than usual in the present report, but it is pointed out that several bulletins on fruit growing subjects have been issued recently by the Ministry of Agriculture, and that there are others still in the course of preparation.

The report is divided into four sections, Section I, dealing with experimental orchards—top fruits, small fruits, arable crops, routine spray programme, experimental nurseries, and hops. A general review of research work, with lists of papers published during the year, comprises Section II. This section is sub-divided into pomology, statistics and records, plant physiology, biochemistry, plant pathology, entomology, plant protective chemistry, hops, technical section, and A.R.C. Scottish raspberry investigation. Section III contains a number of research reports and reviews dealing with the subjects covered in Section II, while Section IV contains five bulletins for fruit growers.

## Contemporary Cookery

A RECAPITULATION of recipes gathered during 1945-1947 has recently made its appearance in the form of a book* with appropriate decorations by John Minton and Denton Welch. Here can be found new ideas for soups to make a welcome change to the thin nondescript varieties common in this country and which preface the cold joint at Sunday suppers. Reminiscent of a fashion book are the author's comments on *Potage aux Betteraves*, whose colour scheme of pink, green, and white is said to be "quite ravishing." The French cook treats her fish in all manner of ways, and the reader is regaled with a variety of such recipes together with that all-important accessory—the sauce.

The "desperation" recipes suitable for those occasions when the unexpected visitor or uninvited guest makes their appearance are useful. From the salads and sweets of summer to all the garnishings for a successful Christmas party—a wide range, but amply covered. And to whet the appetite of those hoping for holidays abroad is a chapter devoted to food from foreign parts, including Norway, Sweden, Denmark, Portugal, Austria, Italy, and Hungary.

Wines, cocktails, and the preservation of fruit form the subjects of the concluding chapters of this book, which deserves a place on the shelves of the enterprising cook, if her bookshelf is not already full of cookbooks.—J. R.

* *Vogue's Contemporary Cookery*. By Doris Lytton Toye. London. Pp. 136. Price 5s. net.

# Bakery Industry Research

A TOUR of the different departments of the Research Station of the British Baking Industries' Research Association at Chorleywood, Herts., conducted by the Director of Research, Dr. J. B. M. Coppock, B.Sc., Ph.D., F.R.I.C., on March 5, showed the considerable progress that has been made in the short time which has elapsed since the premises were occupied on August 5, 1947.

**Laboratory Work**

The work of the analytical laboratory in charge of Mr. W. H. Templeton, B.Sc., F.R.I.C., is in full swing, and has already given service to members having urgent technical problems which could be solved by chemical examination.

A second laboratory designed for general and organic chemical research work has just been completed. In this laboratory, in charge of Mr. R. C. A. Bradshaw, B.Sc., will be studied problems connected with emulsion formation, staling, batter stability, and certain aspects associated with the biscuit industry.

A very necessary ancillary to these two laboratories is the provision of a photographic darkroom. This is nearing completion, and much of the necessary equipment has been obtained.

In view of the existing difficulty associated with large building projects, the construction of a bakery in the grounds has been postponed and, as soon as the necessary building licence has been obtained, work will commence on a temporary experimental bakery within the existing building. Pending the completion of this bakery, facilities are at the disposal of the Association by an arrangement with the Principal of the Royal Technical College, Glasgow, where Mr. H. Hulse, B.Sc., is actively engaged on research problems.

Many of the benches and fittings required for the physics, bacteriological, microbiological, and physical chemical laboratories have been obtained, and the construction of these laboratories will commence as soon as the experimental bakery is completed and a further building licence obtained.

In charge of the library is Miss E. M. Laing, A.C.I.S., who is also the Information Officer. Some eighty British and foreign scientific and trade publications are received monthly. A large collection of scientific journals and books vital to the research work of the Association have been obtained, many by purchase of an existing library, a number by presentation, and further additions will be made frequently. Another member of the staff is Miss M. E. Stonestreet, Experimental Officer.

Publication of *Baking Abstracts* was commenced in January. Published monthly, they are sent free of charge to members, and are divided into two sections—Science and General. The former includes abstracts of current information on such items as cereals, sugars, fermentation, aeration, oils and fats, colours and flavours, staling, nutrition, patents, and the latter deals with plant, processes of manufacture, summary of information on practical hints and recipes, packaging, pest control, etc. In addition, the *Bulletin*, a bi-monthly publication, was first issued in February, and contains scientific articles of interest to bakers. As occasion demands, publication also takes place of reports on the research work of the Association, and the first two reports are already available, and are also issued free of charge to members.

Since the appointment of Mr. S. T. Killick as Secretary to the Association, the installation of business systems capable of expansion with increasing membership has proceeded, for though the primary function of the Association is to conduct research, it is clear that efficient service can only be achieved by organising an adequate administrative machine.

The Council of the Association is at present discussing with the British Standards Institution the formation of an Industry Committee as a preliminary to setting up Technical Sub-Committees to consider specifications and standards for raw materials, plant, and equipment used in the baking industry.

**Target Figures**

A good response is being made by the industry and support for the Research Association is steadily increasing. In order to qualify for the Government grant from the Department of Scientific and Industrial Research, the target to be attained this financial year ending on June 30, is £12,000. Last year the Association was £4,500 short of this figure, but progress so far has been such that the target is only short by £310. In the next financial year, however, £17,000 is the target, so that every assistance in expanding the membership of the Association is required.

If the target for this year is exceeded the Association receives a further £100 from the Government for each £100 in excess of £12,000 contributed by the industry.

The following changes in Council have been made:

Dr. H. R. Barnell, of the Scientific Advisers' Division, Ministry of Food, has, at the invitation of Council, been nominated by the Minister as his representative.

Mr. R. D. Mason, M.Sc., F.R.I.C., has been co-opted as a scientific member of the Council.

Mr. J. R. MacLeod, B.Com., C.A., one of the Scottish members, has resigned from the Council due to pressure of business, and under the Articles of Association the Council has invited Mr. John MacMillan, President of the Scottish Association of Master Bakers, to serve in his place.

# News from the Industry

## Forthcoming Events

The annual general meeting of the Edinburgh and East of Scotland Section of the Society of Chemical Industry to be held in Edinburgh in July, 1948, will include a lecture on "Brewing" by Dr. I. A. Preece, followed by a visit to the Abbey Brewery of William Younger and Co., Ltd. There will also be a lecture on "Paper-making" by Mr. S. R. H. Edge of Aberdeen, and a visit to the Penicuik paper mill of Alex. Cowan and Co., Ltd. Other lectures will include one on "Fisheries" by Dr. G. A. Reay of the Torry Research Station and one by Mr. H. Corteen of the British Jute Trade Research Association, Dundee, on "Research Developments and Applications to Textile Industries in East Central Scotland."

Works visits will include tours of the pharmaceutical chemical works of T. and H. Smith, Ltd., and of the cereal mill of the Scottish Wholesale Co-operative Society, Ltd.

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Meetings arranged by the Royal Sanitary Institute for April and May, 1948, are as follows:

*Hove Sessional Meeting.* April 10, in King Alfred Baths. Papers on "The Sterilisation of Sea-Water Baths with Special Reference to Ozone Treatment" by N. E. Chadwick, M.D., D.P.H.; "Sanitary Survey," by F. Dransfield. A visit to King Alfred Baths will be made in the afternoon.

*London Sessional Meetings.* April 14, at the Institute. Symposium on "The Hygiene of the Preparation, Storage, and Distribution of Food" by the following members of the staff of the London County Council: S. G. Burgess, B.Sc., Ph.D., F.R.I.C., J. Croft, Miss E. A. Earle, J. E. MacCartney, D.Sc., M.D., and C. J. Regan, B.Sc., F.R.I.C.

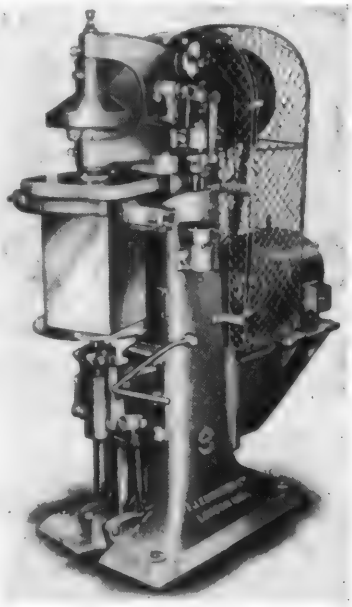
May 12, at the Institute. A paper on "Present Standards and Practice in the Field of Ventilation" by A. Leslie Longworth, B.Sc., A.M.I.C.E.

## Industrial Exhibition Change

In view of delays experienced by some exhibitors, the Engineering and Industrial Equipment (Home and Export) Exhibition will now be held from May 19 to 28.

## Canning Equipment

A double seaming machine for irregular cans with an output of 400 to 500 an hour is being manufactured by F. J. Edwards, Ltd.



Of the semi-automatic type with hand feed, the machine is suitable for round, oblong, square, oval, and almost any irregular shaped cans from 2 in. to 13¾ in. diameter or diagonal and up to 13¾ in. high. It is arranged for motor drive with a cone pulley giving a choice of three speeds, the seaming table being raised by treadle which also engages a clutch and brings the seaming wheels into operation. These are disengaged automatically when the seaming cycle is complete.

## Mobile Cranes

Low running costs and simplicity of control are only two of the advantages of the Jones' mobile Diesel-powered cranes, distributed by George Cohen Sons and Co., Ltd. The cranes need no gantries, rails, or trailing cables and can be fitted with extra equipment to make them suitable for handling almost any type of load.

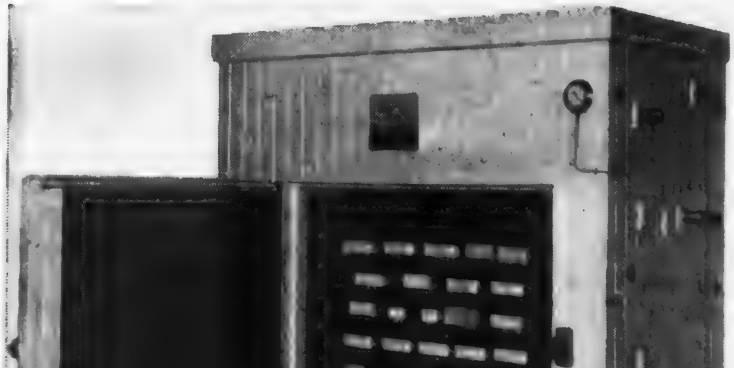
## Automatic Gas Control

An appliance for correcting the wide fluctuations of gas pressure from the mains and automatically converting them into a steady internal pressure is the subject of a recently published National Physical Laboratory Report. Conditions of mains pressure were reproduced ranging from 3 to as much as 9 inches, and the automatic gas control device was set to control the output to constant pressures pre-set from 1¼ to 2¾ inches. The published tests show that this new invention controls all fluctuations of pressure, is able to interpret its individual setting with 97 per cent. of accuracy, achieves a minimum saving in gas consumption of 20 per cent., and produces a constant pressure giving the best type of heat flame.

## Water Heating

Under the Food and Drugs Act all establishments in which food is handled are now required to provide a supply of hot water, soap, and towels. A simple solution of the problem is provided by the Ascot Instantaneous Boiling Water Heater, which, dependent upon the setting of the temperature selected to one of three settings, boiling, hot, or warm, supplies a constant flow of water at any one of these three temperatures.

The great advantage of the heater is its economy in the use of fuel. As the gas is alight only while the water is running and is extinguished directly the tap is turned off, only that amount of gas is consumed which is required to heat the water necessary for immediate use. The Ascot also helps to reduce overhead expenses because it is inexpensive to instal.



**Quick freezing plant for the processing of fish, meat, poultry, rabbits, game, vegetables, and fruit.**

### Quick Freezing Plant

Rapid freezing, which is among the special features of the quick freezing plant, manufactured by J. and E. Hall, Ltd., is achieved by bringing the product into contact with a refrigerated metal shelf while it is simultaneously submitted to the freezing effect of a low temperature air blast. The special design of the cooling system ensures that the heat is removed rapidly from the upper surface of the product by fast moving air and from its lower surface by direct contact with the metal plates at very low temperature. The capacity of the freezer is approximately 3 cwt. with a freezing rate of about 1 cwt. per hour which is increased if freezing in cartons is required.

The company also manufactures two main types of cold stores, the sectional type which can be dismantled and re-erected on another site, and the built-in type which can utilise one or more existing walls in the formation of an insulated and fully equipped cold store compartment.

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### Obituary

We regret to announce the death of Mr. W. G. Hetherington, chairman and managing director of Creamola Food Products, Ltd.

### Dicing Machinery

Capable of cutting fresh, frozen, and cooked meat, offal, fish, potatoes, turnips, carrots, apples, pineapples, oranges into cubes, slices, or strips, and with an approximate output of 9 cwt. per hour, the first British built dicing machine is being manufactured by Richard Brandt and Co., Ltd. Of strong construction, the machine has a built-in 2 h.p. motor with stainless steel cutting knives and a feeding box of a special alloy which is non-corrosive. The machine can be adjusted for various sizes of cubes, slices, or strips.

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### Institutions to be Merged

In furtherance of the co-operative spirit existing in the vital field of industrial management, negotiations have been proceeding since November, 1947, to achieve a merger of the Institution of Factory Managers and the Institution of Works Managers. The councils of the two Institutions now announce a unanimous desire to proceed with the amalgamation. The proposals agreed upon by the representatives of the two bodies are being submitted to general meetings for approval forthwith, and each council will strongly recommend acceptance.

### Packaging Materials

Established in 1900 by the late Mr. Felix Maginn, the Alliance Box Co., Ltd., now own and operate three well-equipped factories for the production of solid and corrugated fibreboard cases and boxes, and cardboard and paper-covered boxes. In addition to supplying cases to railway requirements, the company, in conjunction with their associate company, Alliance Safe Transport Guarantee Co., Ltd., will insure the contents of cases manufactured by them against damage in transit.

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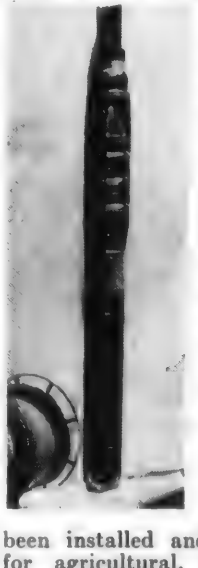
### Centrifugal Pumps



Among the range of electrically driven centrifugal pumps manufactured by the Pulsometer Engineering Co., Ltd., is the multi-stage vertical spindle submersible pump which can be used to raise water from any type of well. It will operate without maintenance for a considerable time once it has been installed and can be used for agricultural, dairying, and general industrial purposes. Automatically operated sets can be linked with sprinkler or hydrant systems for fire fighting, or used as emergency pumps on existing systems. Propeller pumps are also produced for use where large quantities of water have to be moved against low heads, while the "solids diverter" designed for the automatic pumping of liquids containing solids has an enclosed tank pumping plant which may be operated without risk of choking.

Smaller pumps designed for water or brine circulation, boiler feeding, boosting and so on, and vacuum pumps, supplied with flat or vee-groove pulleys or direct coupled motors, which are made for use with milking machines, are also available.

## Appointments

In view of the increasing responsibilities of the Director of the British Industries Fair (Mr. R. E. J. Moore) the Export Promotion Department of the Board of Trade has appointed Mr. W. H. Young, who has been associated with the organisation of the B.I.F. in London since 1922, to be Deputy Director of the Fair.

*

In order to form a liaison between their home and overseas organisation Mono Pumps, Ltd., have secured the services of Mr. Alexander Behr as Export Superintendent.

Mr. Behr has had much experience of such work and his duties with the company will take him to almost every country in the world.

*

Dr. G. L. Riddell, F.R.I.C., Director of Research of PATRA, has been appointed for 1948 to the Chemistry Advisory Committee of the Technical and Scientific Register of the Ministry of Labour and National Service.

*

Mr. R. M. L. Francis, managing director of National Adhesives, Ltd., has been appointed Executive Vice-President of their Associated Company in Canada and managing director of their Toronto and Montreal factories. His headquarters are in Toronto. Mr. Francis retains his position as managing director of National Adhesives, Ltd., Mr. A. R. G. Williams having been appointed deputy managing director during his absence.

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## Heat Treatment of Ice Cream

A decision has been made by the executive council of the Ice Cream Alliance to request the Ministry of Health to extend for another twelve months the present period of grace in respect of certain requirements of the Heat Treatment Regulations. The position of machinery supplies has improved very little, if at all, since last May and no one considers it possible for the many orders for cooling appliances still outstanding to be met by May 1, 1948. The position with regard to recording thermometers is even worse.

# New Treatment for Herring

## TO END PERENNIAL PROBLEM OF GLUTS

Working in close association with the Herring Industry Board, scientists of the Torry Research Station of the Department of Scientific and Industrial Research have evolved a new method of treating herrings which, when fully developed, will, it is hoped, put an end to the perennial problem of gluts and, at the same time, make a significant contribution to the solution of the world-wide problem of shortage of fats and proteins.

The essential value of this process to the herring industry lies in its flexibility, which allows widely varying quantities of herrings to be absorbed day by day into pre-treatment plants in which an initial process or preservation takes place. At a later stage, the herrings are broken down by chemical action into their natural constituents, the more important of which—edible oil and protein—are suitable for human consumption. Certain industrial uses have already been found for the by-products of the process and further explorations in this connexion are being carried out.

A pilot-scale chemical reduction plant was set up and operated by the Herring Industry Board at Great Yarmouth, during the autumn herring fishing season of 1947, in which the findings of earlier laboratory experiments were confirmed and the commercial feasibility of the process established.

Despite present difficulties of supply of plant, machinery and buildings, the Board are making strenuous efforts, by improvisation and adaptation, to construct the first of a number of reduction plants in time for the 1948 summer herring fishing season.

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## Combination Canned Foods

A new invention in food packaging permits two foods of separate flavour to be packed in one can without any possibility of the flavours blending.

One obvious advantage is that food can be packed with sauces, and the customer is at liberty to eat the food with or without the additional flavouring as required. The method consists of introducing into cans of food a sauce-filled sack, made of Pliofilm, which prevents any interchange of flavouring between the food and the sauce.

The first product to be packaged in this manner—a can containing Wiener sausages and sauce—is already on the American market.

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## Regulations and the Baking Industry

"Regulations are strangling the baking industry, and we want them removed at the earliest possible moment," declared Mr. Bostock, chairman of the Executive Committee of the Bakers' National Association at the N.A. Council meeting recently at which the Minister of Food was present. While the bakers' raw materials and prices of finished products were controlled, wages and overheads were not. A wall was being built round the small producer and he had no step-ladder such as that sometimes used by the large producer in the way of salvage. He felt that some advance on the bread subsidy was due and he asked the Minister to make some declaration on policy in regard to that. A statement had been made in the House that certain subsidies are threatened and the baking trade are anxious to know what is the policy on bread subsidy.

"We strongly urge a reduction in the flour extraction as early as possible," he said. "I know this is an involved question and a question of cereals for dollars, but it can be argued that if we had a reduction in extraction there would be feedingstuffs to save dollars. The question can be argued from many angles."

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## Essex Beet Sugar Production

The executive committee of the Essex National Farmers' Union are advocating either an immediate extension to Felstead beet sugar factory or the building of a new factory in view of the large acreage of beet under cultivation in the county.

# Polishing of Tinplate

## USE OF WASTE PRODUCT SAVES CATTLE FOOD

The final stages in the manufacture of tinplate involve the passage of the plate, after leaving the tinning bath, through rollers immersed in oil. Excess of oil is removed and a polished surface imparted by treatment with a material having the requisite absorbency and smoothness. The use of wheat offals was standard practice for this purpose, but because of the food value of the wheatings, especially for the feeding of cattle, it became necessary to find a substitute.

During the war flax was grown much more extensively in this country than hitherto. Large quantities of waste shives were produced in the retting of flax. They are useless for food and some useful outlet was desired.

Research was undertaken at the Chemical Research Laboratory, Department of Scientific and Industrial Research, and it was found that, by suitable grinding, the shives could be reduced to a material having the properties essential for the polishing of tinplate. Results were passed to industry by way of the Tin Research Institute, who carried out further experiments. The material proved eminently suitable to the industry.

As a result, some thousands of tons of additional food for cattle have been made available annually and a waste product has been given a useful outlet. Furthermore, another waste product, wood meal, is now also being used instead of wheatings.

### Sweeter Beet

From September, 1947, to January, 1948, 11,559 wagon loads of sugar beet, totalling 101,426 tons, were conveyed by rail to the Sugar Beet Factory at Kidderminster from Oxfordshire and the West and South of England.

Due to the drier and sunnier weather, the sugar content was 18 per cent. compared with 16 per cent. last year and the crop was in an exceptionally clean condition.

### New Microfilm Reader

Developed to meet the requirements of the International Federation of Documentation, a new microfilm reader will be displayed at the Engineering and Industrial Equipment (Home and Export) Exhibition to be held at the Royal Horticultural Hall.

The microfilming process is now being widely used in the export trade and the reader is a self-contained viewing apparatus for examining microfilm negatives or positives in rolls up to 100 feet in length, and in both 35 and 16 millimetre sizes.

Microfilmed particulars of technical data and other information can now be sent by air mail at ordinary letter rate, thus eliminating the necessity to despatch bundles of documents by air freight or by land-sea routes.

### Visitors from America

Mr. G. E. Wallis, President and general manager of The Creamery Package Mfg. Co., Chicago, and Mr. E. B. Lehrack, Vice-President in charge of sales of the same firm, sailed from New York on March 27 for a short visit to this country to attend a series of meetings with the officials of The Creamery Package Mfg. Co., Ltd., Avery House, London.

Joining the American company as a salesman in 1916, Mr. Wallis later set up and managed the firm's Boston branch. He was then placed in charge of the company's Export and Eastern Sales Division, including Boston, New York, Philadelphia, and Buffalo branches. His present position dates from 1933. Mr. Wallis made a trip to this country some years ago to assist in the formation of the English company of which he is a director. He later organised Creamery Package Mfg. Co. of Canada, Ltd., with headquarters at Toronto. A former President of the Dairy Industries Supply Association, Mr. Wallis is at present a director and member of the Association's executive committee, treasurer of the National Dairy Council, a director of the Air Conditioning and Refrigeration Machinery Association, and a life member of the American Society of Refrigerating Engineers.

Mr. Lehrack joined the company as a salesman with the firm's Kansas City branch in 1919. In 1927 he left the company and started the Lehrack Ice Cream Co., at Wichita Falls, Texas, which was later merged with the Ferguson Ice Cream Co. During this period Mr. Lehrack served as a director of the Texas Ice Cream Manufacturers' Association and was a member of the International Association of Milk Dealers, now known as the Milk Industry Foundation. He later sold his business to the Carnation Co. and became supervisor of their chain of fresh milk and ice cream plants operating throughout the south-west. In May, 1935, Mr. Lehrack returned to Creamery Package as assistant to the President, and was made Vice-President in charge of sales in February, 1937. Mr. Lehrack is also co-chairman of the National Association of Dairy Equipment Manufacturers.

### New Cod Liver Oil Factory

A Norwegian company is expected to operate a factory in Aberdeen for refining cod liver oil for medicinal purposes in the near future, application having been made by Aarsaether Bros., of Aalesund, for the necessary authority.

### Sugar Research

Last year growers of sugar beet contributed £9,421 in the form of a levy on beet delivered to the factories to the Research and Education Fund run by the British sugar industry, a like amount being contributed by the British Sugar Corporation on behalf of the factories. On the expenditure side nearly £14,000 was given in grants to research institutions, and further sums of £900 and £2,700 were used for education and publicity respectively.

## B.I.O.S. Reports

Critical summaries covering the reports of the British Intelligence Objectives Sub-Committee, the Field Information Agency, Technical, and the Combined Intelligence Objectives Sub-Committee are shortly to be published under the title of B.I.O.S. Overall Reports. These reports should give a clear answer as to how Britain can best utilise the new developments in Germany which have come to light through the full investigation of German industry.

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## Booklets Received

An account of some of the botanical drugs, culinary seeds and spices, and other raw products handled by H. Frischmann is included in a recently published booklet which is prefaced by an interesting history of Mincing Lane, the former location of the company's premises, which were destroyed by fire during an air raid in 1941.

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The answer to maximum and continued production in the textile industry can be found in a 12-page booklet published by J. H. Fenner and Co., Ltd., which illustrates the merits of power transmission by group and individual drive supported by photographs of actual drives installed in textile mills.

After surveying briefly the evolution from the water wheel, steam engine to electrical energy, power transmission in the form of group driving is introduced, a system defined as an arrangement whereby two or more machines are driven by a single source of power. The machines are connected up, generally by means of flat belting, to lineshafts, on a definite plan of production flow, with a vee-belt drive from motor to lineshaft. The more modern type of power transmission is the individual drive, described as the drive where each machine is driven by a single independent source of power, usually an electric motor.

The booklet concludes by comparing the two methods of driving on the basis of actual figures of installation and running costs, in relation to overall production costs. The increase in production and quality—a fact of utmost importance when facing foreign competition—as obtained from the individual drive, gives it a decided advantage over the group drive.

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A concise outline on the subject of stock control by W. Gildon, M.Inst.T., M.P.O.A., has been published in booklet form by the Purchasing Officers' Association. For the sake of clarity and logical sequence, forms have been introduced relating more to the function of purchasing than to stock control, but as these two functions are inextricably interwoven, their inclusion should assist the student by giving a complete picture of operations.

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## OBITER DICTA

● If we are eating the Argentine Railways this year, what are we going to eat next year?—*Mr. Reid, M.P.*

● I do not suppose there will be any great increase in the amount of water used for drinking. It is a dangerous practice as it rusts one's inside.—*Lieut.-Col. Corbett, M.P.*

● It was deceptive to talk of an eldorado of monkey nuts which raised the hopes of the public that in a short time they would get an unending flow of "marg."—*Mr. Walter Fletcher, M.P.*

● It is beyond all reason that ice cream vendors should be allowed to continue charging sixpence for a blob of muck.—*Councillor L. G. Roy at a meeting of the Wood Green Food Committee.*

● There was a time when the London river so teemed with salmon that London employers were forbidden to feed their apprentices with Thames salmon more than twice a week.—*Mr. Berry, M.P.*

● Churchill warned us the Gestapo would come, and this is it. Officials walked on to my farm and asked about my stock, crop average, and how many people I was employing.—*A Northumberland farmer.*

● How is the housewife expected to answer question 9J which asks whether she finds it easier to open her oven door with her hand, or her foot, or with neither, or with both?—*Mr. Marlowe, M.P., speaking of the questionnaire to housewives to find the best type of solid fuel cooker.*

● I am sure that every farmer must know that I have power at this moment to give directions for anything that one felt ill-mannered enough to give, but no directions have been given.—*Mr. Tom Williams, Minister of Agriculture, at a meeting of farmers at Taunton.*

● Twenty million people in this country are existing on a miserly, beggarly ration of two pints of milk a week. If you have not tried living on two pints of milk a week, let me commend that exercise to you.—*Mr. W. B. Mercer, West Midland Director of the N.A.A.S., at a meeting of Cheshire farmers.*

## Hints to Business Men

Finland has now been included in the series of "Hints to Business Men" booklets issued by the Export Promotion Department of the Board of Trade. Its publication coincides with the re-issue of revised versions of the Iraq and Central America booklets in the same series.

Thirty-five of these booklets have been issued from time to time, but owing to the heavy demand nine of them are temporarily out of stock and are being revised and reprinted.

Booklets in stocks relate to Argentina, Paraguay and Uruguay, Australia, Brazil, Belgian Congo, British East Africa, British West Indies, Canada, Central America, Colombia, Cuba, Dominica and Haiti, Ecuador and Peru, Egypt, Switzerland, Finland, India, Iraq, Newfoundland, New Zealand, Persia, Portugal, Madeira and Azores, Portuguese E. and W. Africa, South Africa and Southern Rhodesia, Spain and Canary Islands, Sweden, Turkey, and Venezuela.

Those temporarily out of stock are Bolivia and Chile, Eire, Mexico, Palestine, U.S.A., Belgium, France, Denmark, and Norway.

Single copies of the booklets are available only to bona fide business men making arrangements for a forthcoming visit to an overseas country. Applications should be sent to Export Promotion Department, 35, Old Queen Street, S.W.1.

# News from Overseas

### Jam Tariffs in Eire

An Order was made recently re-imposing the suspended protective tariffs on jams and sweets at the rates in force in Eire prior to December, 1946, when the tariffs were temporarily suspended because, owing to difficulties in obtaining raw materials, Irish manufacturers were unable to meet the full demands of the home market.

Duty-free imports of jams and sweets, both English and foreign, had recently reached abnormally high levels according to an official statement, and in anticipation of a reduction in the volume of imports of these items the Minister for Industry and Commerce had decided to increase by 25 per cent. from February 1, the quantity of sugar allotted to the two categories of manufacturers concerned, who should then be enabled to meet the full needs of the home market for jams, marmalades, sweets, and other forms of sugar confectionery.

In view of the restricted supplies of sugar available the Minister had not found it possible to grant any increase in sugar allowances to makers of flour confectionery, mineral waters, ice cream, or any classes other than those mentioned in the official notice.

### Frozen Meat in Italy

Under the Italian-Argentine commercial agreement 12,000 tons of frozen meat is exported annually to Italy. Although half the 1947 quota has arrived, nearly 5,000 tons of this is still in the refrigerating plants of Genoa, Verona, Naples, and Venice. This situation is due partly to the general weak situation of the market and partly to the aversion of Italians to frozen meat. During a period of two months the City of Rome has consumed only 200 tons out of the 500 tons allocated to that city.

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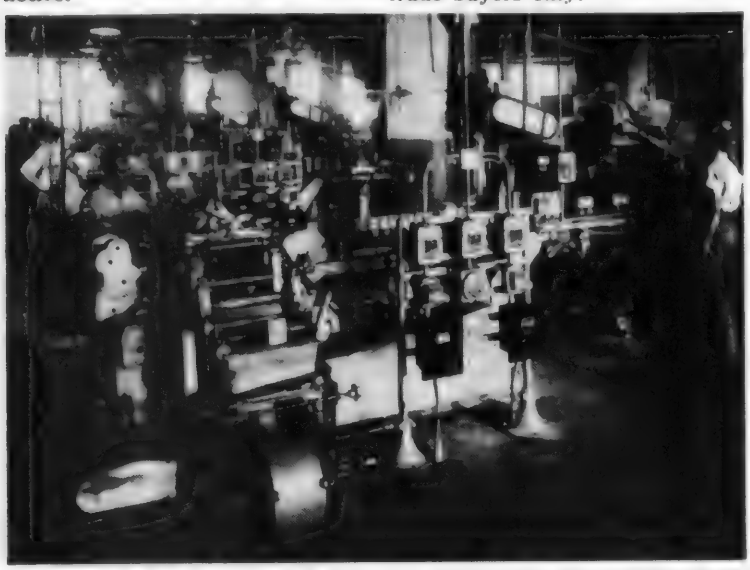
### International Trade Fair

In anticipation of a greater attendance this year, the Lyons' International Trade Fair, to be held from April 3 to 12, is being extended by the addition of a new exhibition building which will house exhibits from several nations. Arrangements have also been made to take over all accommodation in some of the bigger hotels in neighbouring towns. Transport from these towns will be available to the Fair each day for trade buyers, and at certain times the Fair will be open to trade buyers only.



**A production line consisting of seven complete combinations of pneumatic double package equipment producing seventy cartons a minute.**

### Leafless Tea

The Nestle Milk Products Co. is reported to be preparing leafless tea in the form of a concentrate similar to soluble coffees.

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### Italian Olive Harvest

The harvest of olives from the Taranto Province of Italy which was completed at the end of February is expected to yield approximately 60,000 tons of olives as compared with the 31,000 tons gathered last year. It is anticipated that some 12,000 tons of oil will be produced from this crop.

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### American Food Pioneer

Fitting tribute to the important work in food research performed by the late Dr. George Washington Carver, who died at Tuskegee, Alabama, on January 5, 1943, has been paid by the United States Post Office Department through the printing of a special 3 cents (purple) commemorative postage stamp issue.

Born on a farm near Diamond Grove, Missouri, in 1864, and after attending Iowa State College where he received the degree of Bachelor of Science in agriculture in 1894 and his M.Sc. in 1896, Dr. Carver entered Tuskegee Institute as Director of the Department of Agricultural Research.

Dr. Carver conducted many researches with agricultural products—especially the peanut and sweet potato, from which he derived more than four hundred substances—contributing greatly to the economic advancement of the southern States. He was appointed as a collaborator in the Bureau of Plant Industry of the United States Department of Agriculture in 1935.

Dr. Carver's interests were wide and it is recorded that he developed a formula for synthetic rubber for the late Henry Ford, and even gave the medical profession a formula for the treatment of infantile paralysis.

### Weed Killers

Weed killers and methods of application are the subjects of three bulletins issued by the College of Agriculture, University of California.

General-contact weed killers are used to control unwanted plant growth along highways and around farm and industrial buildings. Sodium arsenite, which was commonly used for such purposes, is now being replaced by new sprays which are non-poisonous, cheap, and easily applied.

Weed control by oil spraying in carrots and related crops has largely replaced hand labour in many districts. While the cost of spraying by this method varies with the type of oil used, size of spray rig, and extent of operations, the expense will usually be much less than that for hand-weeding.

A chemical, 2,4-D, for controlling weeds in grain fields, grass pastures, lawns, and strawberry beds has been used with great success. Two weeks or more may elapse before the treated plants actually die and two or more sprayings are usually necessary to effect a complete kill of perennial weeds. The chemical and its compounds are non-poisonous to humans and animals, non-corrosive, and neither explosive nor inflammable.

### Belgium to Abolish Food Ministry

An announcement that the Belgian Food Ministry will be abolished within the next two or three months has been made by the Food Minister, M. George Moens de Fernig. He gave as the reason the fact that only fats will be subject to international allocation for another year or so whereas other imports of foodstuffs will be free.

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### Australian Beef Production

The British Food Mission in Australia will visit Darwin to investigate the Commonwealth's plan for increasing beef production in the Northern territory by 40 per cent. in two years for export to Britain.

The plan provides for the construction of killing centres at Alice Springs and near Brunette Downs, on the Barkly Table lands in Queensland adjacent to the Northern territory boundary. Cattle killed at Alice Springs would be transported in refrigerated trucks to Adelaide and from Brunette Downs across the Barkly Highway to a Queensland port.

The British Mission will also investigate the long-range plan for peanut growing and other products involving the construction of new railways.

### Food Industries Exhibition

Organised by the Confederation of Belgian Food Industries, a second Exhibition of the Food Industries will be held in Brussels from July 3 to 18.

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### Cherries from Seaweed

An invention for the manufacture of edible imitation cherries and the like from the algin of seaweed is referred to in the report of the Eire Controller of Industrial and Commercial Property for the year ended March 31, 1947.

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### Malayan Pineapple Industry

A comprehensive scheme of reconstruction including the development of new areas for pineapple cultivation and the re-equipment of canneries with modern processing machinery has been put into operation in Malaya where extensive damage occurred to plantations and factories during the Japanese occupation. Before the war Malayan canned pineapple represented nearly 90 per cent. of the imports of this product in the United Kingdom, and, although no great increase in the rate of production will occur before the end of 1949, it is expected that the industry will then be able to offer a pack superior in quality to that produced pre-war.

# News from the Ministries

### Prices of Cereal Filler

The Cereal Fillers (Control and Maximum Prices) Order, 1944, has been further amended to provide for increased maximum prices of cereal filler.

The new prices, which came into force on February 29, 1948, are as follows:

| | *New Price Per Ton.* | *Present Price Per Ton.* |
|---|---|---|
| On a sale to a manufacturer or retailer, or by retail .. | £37 5s. | £34 10s. |
| On any other sale .. .. | £29 15s. (plus carriage at cost up to 30s. a ton) | £28 0s. (plus carriage at cost up to 30s. a ton) |

### Wholesale and Manufacturing Licences

All ex-manufacturers or ex-wholesalers in the food trades who are thinking of re-opening old businesses (the priority group) and who have not already applied to the Ministry of Food for a licence, should do so before June 30, 1948, if they wish to receive special consideration. Applications should be addressed to the Ministry of Food, Portman Court, Portman Square, London, W.1.

After that date the only people who will be given preference in the granting of manufacturing or wholesale licences will be suitable disabled persons selected in consultation with the Ministry of Labour.

### Anglo-Dutch Trade Agreement

The recent trade agreement between the United Kingdom and Holland provides for the shipment to this country of a wide variety of Dutch foodstuffs, including milk products, eggs, bacon, fruit, and vegetables up to a value of £24 millions in 1948.

This amount will be divided equally between the following four groups:

1. Milk products, including cheese, condensed milk and milk powder, eggs, and bacon.
2. Fresh fruit and vegetables including potatoes and onions.
3. Processed fruit and vegetables.
4. Small quantities of miscellaneous foods including such items as canned meat and pulses.

## Olive Oil Imports

The Ministry of Food is now prepared to recommend the issue of import licences for additional quantities of edible olive oil from sources and at prices to be approved by the Ministry.

Distribution will continue through the Olive Oil Importers' Association, 11, Ironmonger Lane, London, E.C.2, who, by arrangement with the Ministry, are the sole buyers of imported oil and who have been advised of the sources of supply and prices acceptable to the Ministry. Importers should, therefore, make their offers direct to the Association. Applications for import licences should not be made until offers have been accepted by the Association.

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## Transfer of Food Functions

Many of the functions at present exercised by the Ministry of Health under the Food and Drugs Acts were transferred to the Ministry of Food on March 1. This is in consequence of an Order in Council entitled the Transfer of Functions (Food and Drugs) Order, 1948, made under the Ministers of the Crown (Transfer of Functions) Act, 1946.

All these changes affect solely departmental functions. The duties of enforcement and execution placed by the Acts and Regulations upon local authorities are not in any way affected.

The Minister of Health, Mr. Aneurin Bevan, has, in a circular, given local authorities details of the new division of powers. This sets out the duties of the two Ministries as follows:

> The Ministry of Food will become the department concerned with the Preservatives and the Condensed and Dried Milk Regulations and other matters relating to the composition and description of food; with the Meat and Imported Food Regulations and other matters relating to food inspection and food hygiene generally; and with the Milk and Dairies and Milk (Special Designations) Regulations so far as they concern dealers and distributors. The Ministry will also become responsible for approval of terms of appointment, etc., of public analysts.
>
> The Ministry of Health will remain the department primarily concerned with drugs and with matters directly related to the protection of the public from infected food. For example, food poisoning and regulations relating to ice cream, shell fish, and the stoppage of the sale of infected milk. Until the Food and Drugs (Milk and Dairies) Act, 1944, comes into operation, the Ministry of Health will also continue to issue licences to local authorities who are producers of designated milk as well as deal with appeals from producers against refusal, suspension, or revocation of producers' licences.

All Regulations under the Food and Drugs Act, 1938, which are at present made by the Minister of Health, will in future be made jointly by the Ministers of Food and Health. Certain changes are also being made regarding functions under the Act exercised now by the Minister of Agriculture and Fisheries and certain Regulations relating to milk, for example, will be made jointly by the Ministers of Agriculture, Food and Health.

None of the changes involved in this transfer of functions affects the position in Scotland.

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## Meat for Manufacturing Purposes

Further very limited supplies of goat meat are available for distribution to Group I manufacturers through W.M.S.A.'s.

The prices at which W.M.S.A.'s have been authorised and instructed to sell goat meat and offals to manufacturers are as follows:

| | *Per lb.* |
|---|---|
| Carcass .. .. | 5½d. |
| Offals— | |
| Liver .. .. | 8d. |
| Kidney .. .. | 9d. |
| Tongue .. .. | 9d. |
| Heart .. .. | 8d. |

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## Weight Allowance for Wrappers

It has been decided that the tare allowance in respect of hessian wrappers on packages of bone-in mutton and lamb cuts from South America shall be ¾ lb. No allowance will be made when the packages are covered only with stockinette.

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## Resignation and Appointment

Mr. N. W. Damerell, Director of Fish Supplies, relinquished his appointment on February 29, 1948, and will be succeeded by Mr. S. P. Dobbs.

## Imports of Canned Foods

Limited quantities of canned soups, canned tomato juice, and canned vegetables (other than canned tomatoes, tomato paste, *purée* or extract) may now be imported under individual licence. The principal sources in respect of which applications for licences will be considered are British Colonies and mandated territories, Eire, Belgium, Luxemburg, France and French North Africa, Holland, and Hungary.

Would-be importers are advised that shipment should not be effected in the country of origin until they are certain that the requisite import licence will be issued, otherwise they may lose their goods.

Applications for import licences should be sent (in duplicate) in the first instance to the Ministry of Food, Canned Fruit and Vegetables Division, Portman Court, Portman Square, London, W.1. Copies of the appropriate forms of application (Form ILD/A) may be obtained from the Board of Trade, Import Licensing Department, 189, Regent Street, London, W.1, from the usual Customs Offices, or from the Ministry of Food at the above address.

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## Australian Egg Contract

The United Kingdom Food Mission at present in Australia has concluded its discussions with the Commonwealth authorities on eggs. Heads of agreement have been signed covering a period of five years beginning July 1, 1948.

The agreement provides for increased production in Australia and for the shipment of increased supplies of shell eggs to the United Kingdom in the latter part of each year for consumption when European production is at its lowest. Provision is also made for a substantial increase in the shipment of frozen and dried eggs.

In the winter months of 1947 Australia contributed four allocations of shell eggs of the total of 58 allocations distributed during the year. The new agreement should mean gradually increasing quantities reaching a peak of seven or eight eggs per person in the winter of 1950 or 1951, equal to about 375 million eggs.

# Information and Advice

## Malt and Honey Bar

B.2283. *Recipe required for the manufacture of a malt and honey bar with chocolate or other coating.* (London.)

The following recipe was given as a basis for experiment:

6¼ lb. finely ground sugar (or 6½ lb. fondant may be used).
1¼ lb. malt extract (the powdered form might be preferable).
Honey flavour and colouring *q.s.*
1¼ lb. honey (alone or with some invert sugar).
1¼ lb. malt flour, alone or admixed with cornflour (failing this, rye flour).
Yield, after processing, about 9½ lb.

The sugar, malt extract, and honey are heated in a steam pan until fairly soft, and then the flour or starch with colour and flavour, thoroughly incorporated. Allow to cool, and stiffen some considerable time with agitation. When properly stiff the product can be suitably processed.

The chief trouble with a preparation of this kind is its stickiness, and the starch (or flour) should overcome this. The starches could be increased if not stiff enough for dipping, or the malt extract could be left out or reduced if the malt flour is considered to give enough flavour. Any subsequent fermentation would not be likely to take place under ordinary conditions, but in hot weather it might be advisable to sterilise the materials.

## Information Supplied

B.2292. *Manufacturers of icing syringes and funnels for icing wedding and other cakes and also manufacturers of equipment for confectionery and aerated drinks, and suppliers of grinding machinery.* (Gold Coast.)

B.2293. *Recipe for custard powder and manufacturers of filling machinery to fill and weigh 1 lb. to 7 lb. block type of flour bag.* (Midlothian.)

B.2294. *Manufacturers of metal partitioning for dividing offices and factory bays.* (Derby.)

B.2295. *Washing machine manufacturers for pigs' feet, etc., approximately 28 lb. capacity and fitted with brushes.* (Lancs.)

B.2297. *British and Continental manufacturers of spray driers.* (U.S.A.)

B.2298. *Procedure for preparing carotene from waste carrots.* (Northern Ireland.)

B.2300. *Information concerning licences required for the manufacture and marketing of pre-packed stuffings.* (Derby.)

B.2303. *Manufacturers of fat-rendering equipment and jacketed steam pans.* (London.)

B.2308. *Firms supplying equipment for and literature dealing with the manufacture of mineral waters.* (Eire.)

B.2309. *Suppliers of machinery for treating sprats for drying before canning, and also literature dealing with the canning of sprats.* (Suffolk.)

B.2310. *Name and address of the manufacturer of a portable refrigerator.* (Channel Islands.)

B.2313. *Manufacturers of machinery for bakers.* (Sweden.)

B.2314. *Names of suppliers of mashed potato powder.* (Switzerland.)

B.2315. *Firms supplying aluminium cans.* (London.)

B.2318. *Literature concerning English laws on the preserving of fruit and vegetables in bottles and cans.* (Essex.)

B.2319. *Makers of machinery for the extraction of peas from the pods.* (Lancs.)

B.2323. *Suppliers of dried egg albumen.* (Kent.)

B.2324. *Names and addresses of firms specialising in quick freezing equipment.* (London.)

B.2325. *Information regarding manufacturers of granite or stainless steel rollers.* (Lanark.)

B.2326. *Manufacturers of cherry stoning machines.* (London.)

B.2332. *Names of suppliers of ice cream equipment.* (Colombo.)

B.2336. *Literature dealing with the manufacture of jam, jelly, and confectionery.* (South Africa.)

B.2347. *Suppliers of hydrolysed protein.* (Durham.)

B.2349. *Manufacturers of plastic brine vats.* (France.)

B.2353. *Information concerning label and trade mark registration.* (Lancs.)

B.2354. *Addresses of makers of synthetic cream.* (Cumberland.)

B.2355. *Importers interested in Australian trade.* (Scotland.)

B.2356. *Suppliers of whey powder.* (Durham.)

B.2357. *Firms supplying machinery for peeling and coring apples.* (Eire.)

B.2358. *Manufacturers of machines for slicing and pulping pineapples.* (Yorks.)

B.2360. *Names and addresses of manufacturers of pie and tart machines and biscuit machinery.* (London.)

B.2362. *Manufacturers of a small capacity hydraulic press and also literature on wine-making.* (West Africa.)

B.2363. *Information regarding the manufacture of sauerkraut.* (Lincs.)

B.2364. *Suppliers of a machine for peeling potatoes.* (Middlesex.)

B.2365. *Manufacturers of machines for wrapping and weighing sausage meat into Cellophane packing.* (Yorks.)

B.2370. *Manufacturers of milk cartons.* (Scotland.)

B.2371. *Suppliers of pasteurising plant.* (Yorks.)

B.2372. *Suppliers of drinking straws.* (Glamorgan.)

B.2373. *Particulars of firms supplying electric sausage fillers and also aluminium containers.* (Scotland.)

B.2376. *Literature on the subject of agenised flour.* (U.S.A.)

B.2379. *Manufacturers of small high-pressure cookers suitable for processing meat and fish pastes.* (Yorks.)

# Recent Patents

*These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents," and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).*

## Specifications Published

*Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.*

590,737. WILLIAMS, W. P. (Proctor and Gamble Co.): Process for modifying fats and fatty oils for edible purposes.

590,750. HAWORTH, W. N., and PEAT, S.: Method for the separation of components of starch.

590,759. CULLIS, L. T. W.: Storage of foodstuffs.

## Abstract of a Recent Specification

### An Improved Process for the Manufacture of Mono-sodium Glutamate and like Glutamic Acid Salts

This invention relates to the manufacture of glutamic acid salts from gluten flour derived from wheat, rice, and other sources and has for its object improvements whereby a purer product of better quality and greater strength is economically obtained.

It has heretofore been proposed to make mono-sodium glutamate from gluten by firstly producing glutamic acid hydrochloride by hydrolysing it with hydrochloric acid; secondly neutralising the hydrochloric acid in a solution of glutamic acid hydrochloride to produce glutamic acid and afterwards adding caustic soda to glutamic acid to form mono-sodium glutamate. According to the processes heretofore proposed, the liquor resulting from the hydrolysis of the gluten has been concentrated at atmospheric pressure to precipitate the glutamic acid hydrochloride. This has caused decomposition of the amino-acids and a substantial loss of hydrochloric acid gas owing to the temperature required to effect the desired concentration. According to the present invention the said liquors are concentrated *in vacuo* at a sufficiently low temperature to prevent these losses. The glutamic acid hydrochloride and the glutamic acid produced at the intermediate stages of the improved process are separated from liquors resulting from previous steps, by crystallisation by which impurities and by-products are left behind, and, in order to obtain the maximum output of such crystals, the exact quantity of alkali to neutralise the free hydrochloric acid in the glutamic acid hydrochloride solution, and that combined as salts of the contained amino-acids, is added to the solution before crystallisation and the exact quantity of the hydroxide or carbonate of the metal whose salt is desired is added to the glutamic acid suspended in water to combine with the entire quantity of glutamic acid contained by it to produce the desired salt.

According to the improved process gluten flour is dissolved in hydrochloric acid and the solution hydrolysed. The liquor, which is heated during hydrolysis, is afterwards filtered to remove humus substances and the filtrate evaporated *in vacuo* to approximately half its volume. An equal volume of concentrated hydrochloric acid is now added and the solution allowed to stand when a heavy deposit of crystals is formed.

The crystals are removed by filtration and washed with concentrated hydrochloric acid. These are next dissolved in boiling water and after being boiled with decolorising charcoal yield a colourless solution of glutamic acid hydrochloride after filtration. Sufficient caustic soda to neutralise the hydrochloric acid is now added in the form of a strong solution. This causes a rise in temperature and yields a heavy deposit of white glutamic acid. The solution and precipitate are now cooled and the latter removed by filtration and dried in a current of air.

A weighed quantity of the glutamic acid thus formed is suspended in a relatively small quantity of water to which the proper proportion of caustic soda in the form of a strong solution is added to form the soluble mono-sodium salt of glutamic acid.

347,258. *H. D. Hardie and Co., Ltd., and Alexander Crawford Stirrat.*

## Trade Marks

*The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).*

**BIRLEC.**—647,867. Installations and apparatus for heating, refrigerating, drying and ventilating, and parts of such installations and apparatus, but not including domestic refrigerators, domestic hair driers, and domestic electric fans. **Birlec, Ltd.,** Birlec Works, Tyburn Road, Erdington, Birmingham, 24; Manufacturers.

**GOLDEN ANGEL.**—648,353. Flour. **Buchanan's Flour Mills, Ltd.,** 5, Fenwich Street, Liverpool, 2; Millers.

**FLORILAND.**—648,372. Preserved, dried, cooked, bottled, and canned fruits and vegetables, rennet, marmalade, jams, jellies (for food); condensed, dried, and tinned milk; vegetable oils (for food), and canned fish. **Gill and Duffus, Ltd.,** 23, St. Dunstan's Hill, London, E.C.3; Merchants.

**CANNON.**—648,521. Gas-burning, steam-heated, electric, or solid-fuel burning installations and apparatus for lighting, heating, steam generating; cooking, cooling, evaporating, refrigerating, drying, and water supply purposes; boilers (not being parts of machines), filters (not for laboratory use and not being parts of engines, of motors, or of machines), stills (not being experimental stills), and parts of all the said goods. **Cannon Iron Foundries, Ltd.,** Deepfields, Nr. Bilston, Staffs.; Manufacturers.

## New Companies

**Alexander Eaves and Company, Limited.** (439115.) 11, Birkenhead Road, Wallasey, Ches. To take over bus. of manufacturers of metal containers carried on at Wallasey by Alexander Eaves and Company. Nom. cap.: £3,000 in £1 shares. Dirs.: A. Eaves, Larkholm, Ince Road, Thornton, Liverpool, 23; W. H. Whatmough, 95, Cambridge Road, Great Crosby, Liverpool.

**Catchpole Engineering Company, Limited.** (439209.) 29/30, Bread Street Avenue, E.C.2. To take over bus. of a manufacturer of sugar beet harvesters carried on at Stanton, Bury St. Edmunds, by Wm. M. Catchpole. Nom. cap.: £25,000 in £1 shares. Dirs.: W. M. Catchpole, Stanton, Bury St. Edmunds; Lord de Ramsey, Abbots, Ripton Hall, Hunts.; G. W. Jones, E. P. Brand, A. H. Ruston, and H. R. Stevens.

**Francis Coales and Son (Bedford), Limited.** (439356.) 23/5, Gwyn Street, Bedford. To take over bus. of flour and provender millers, etc., carried on as "Francis Coales and Son (Bedford)" at Bedford. Nom. cap.: £25,000 in £1 shares. Dirs.: J. L. Coales, The Lodge, Newport Pagnell, Bucks.

**Maco Refrigeration and Electrical Co., Limited.** (439649.) Parkstile Chambers, Market Street, Kettering. Nom. cap.: £5,000 in £1 shares. Dirs.: R. C. Cooke, 18, Rowhill, Kettering; W. H. Martin, 4, Paradise Avenue, Kettering; O. Cowley, 5, Eureka Road, Midway, Burton-on-Trent.

*Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.*